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ENGINEERING • INSTALLATION • MAINTENANCE

electrical contracting

PAGES 41-52

FEBRUARY • 1940

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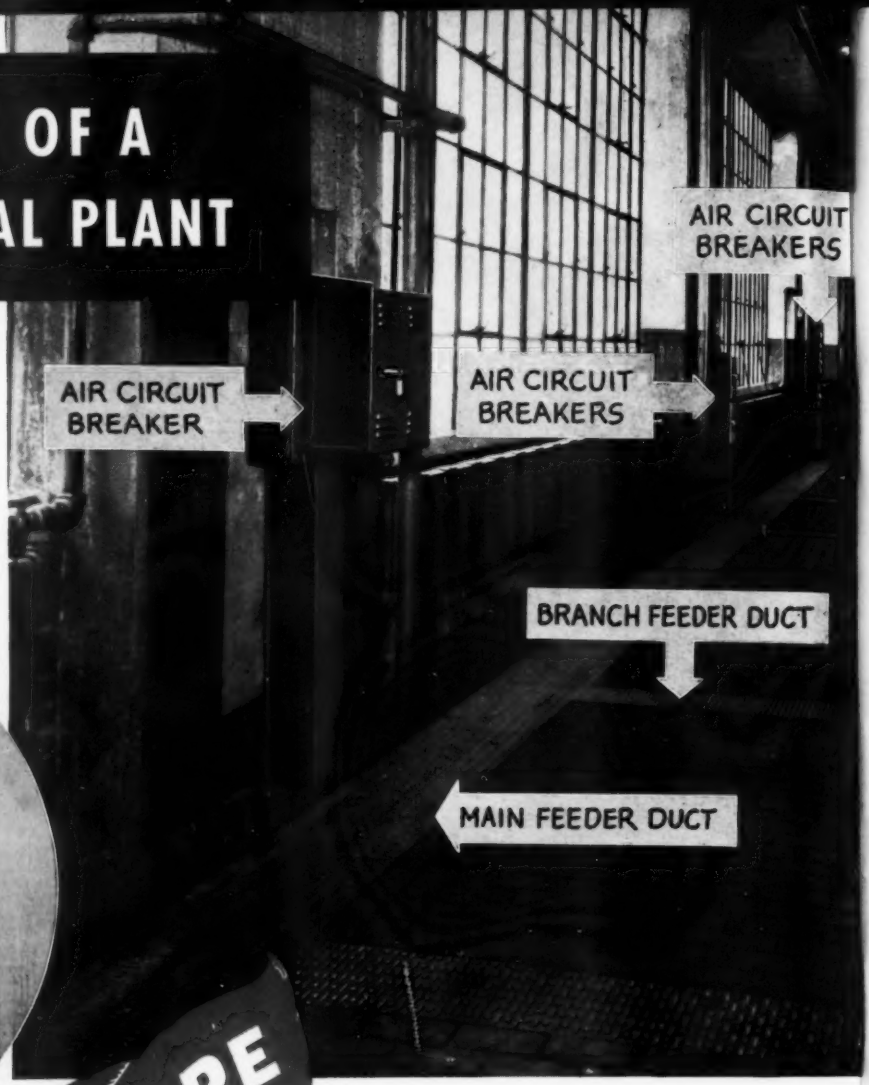
THE SURE SIGN OF A MODERN INDUSTRIAL PLANT



Air Circuit Breakers on All Main and Branch Feeders

He's not afraid. He knows it has plenty of "I C"

"I C" = Interrupting capacity

G-E air circuit breakers are available with interrupting ratings up to 80,000 amperes. You can depend upon getting the specified rating whether the breakers are mounted separately or as factory-assembled boards. If you have any question about how to determine the interrupting capacity needed, in order to know the size of circuit breaker to use, get in touch with the nearest G-E office.

THE severity of a short circuit depends largely on the capacity of the transformers that feed the circuits, and it can *not* be determined by the normal load on the circuit. As plant loads have grown, transformer capacities have been materially increased. Therefore, short circuits present an ever-increasing hazard. They seriously endanger personnel and property wherever the power supply has outgrown the interrupting capacity ("I C") of the protective devices.

Are you sure of your "I C"? With G-E air circuit breakers of *known* interrupting capacity, you *can* be sure.

GENERAL ELECTRIC

890-79

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New!

THEY'RE BAKELITE

For range AND service—showing one of the tool-proof pull-outs removed. Note BAKELITE construction.
When the pull-outs are re-inserted, up-side-down, it is impossible to make contact. (Cat. No. 74-4)

For range OR service — the single pull-out.
The business end of the 60 ampere pull-out. Note heavy one-piece copper blades and fuse clips.

Murray

PULL-TYPE
RANGE & SERVICE
SWITCHES

Metropolitan Device Corporation,
1250 Atlantic Avenue, Brooklyn, N. Y.

NOW, besides the easiest, quickest installation known—besides even better, better-looking construction—besides far simpler, sturdier design, both electrically and structurally—a 60 ampere, No. 72, single pull-out type switch is available in Bakelite, as well as the 60 ampere double, No. 74-4, which has already jumped 'way ahead of expectations in popularity. Get the full story on these new-day, time-and-work-saving range and service switches—all typical of years-ahead MURRAY MODERN METHODS. No obligation.

Easier to Install—Simple—Modern in Design

Here Is Information Electrical Men Ought to Know About the New Benjamin RLM

STREAM-LITER

Reproduced on this page is some of the installation and performance data contained in the recently published Benjamin Bulletin on the STREAM-LITER, the new Benjamin RLM Porcelain Enamel Twin 48" Lamp Unit for general illumination and localized lighting.

Electrical men will be quick to recognize from a study of this data and that contained in the Bulletin the advantages of the Benjamin STREAM-LITER from the viewpoint of both installation and performance.

For General Illumination

The new Benjamin STREAM-LITER provides 18 to 42 foot candles of "DAYLIGHT" quality illumination for the general lighting of factory, office and store. It incorporates all of the latest developments in lamps, auxiliaries and starting equipment and introduces a number of exclusive construction features which assure important savings in time and expense of wiring and installation.

For Specific Location Lighting

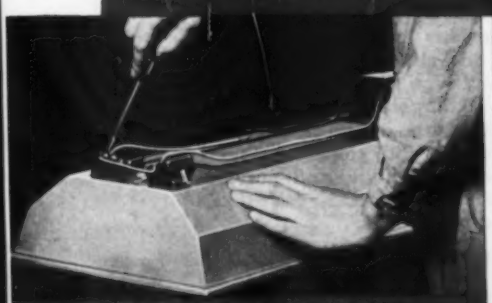
In addition to general lighting, the Benjamin STREAM-LITER has numerous localized lighting applications such as the lighting of benches, machines and long production lines.

Send for New Fluorescent Lighting Data

If you are not receiving information on Benjamin Fluorescent Lighting Equipment, inquire of your Benjamin Distributor for complete information on this and other Benjamin units. Or address the Benjamin Electric Mfg. Co., Des Plaines, Illinois.

BENJAMIN
TRADE MARK
FLUORESCENT LIGHTING EQUIPMENT

Distributed Exclusively Through Electrical Wholesalers

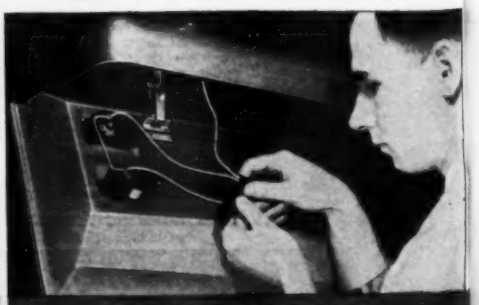


EASIER TO WIRE AND INSTALL

Unhook housing from reflector, suspend it by conduit, chain or wire and bring in the line leads. With reflector on the bench or floor, connect sockets with auxiliary wires and skin line leads.

HOOK REFLECTOR TO HOUSING

With all wiring connections on the reflector completed, simply lift and attach it to the two hinged hooks in the housing where it will hang free with plenty of room to make splices.



BOTH HANDS FREE FOR WORK

Nothing to juggle . . . no one-handed wiring . . . both hands are free to do a fast job. To close unit, just swing reflector up, hinges guide it onto supporting studs, and secure it by thumb nuts.

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electrical contracting

With which is consolidated The Electragist and Electrical Record
Established 1901

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MAIN LIBRARY F E

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—How one motor shop handles re-wiring of a large lifting magnet.

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A SERVICE PAPER for electrical contractors, engineers, motor shops, industrial electricians and inspectors, covering engineering, installation, repairing, maintenance and management, in the field of electrical construction —industrial, commercial, and residential.

Make it happen to you!

Contractor detects dangerous switchboard—wins $1,000 rewiring contract

A SURVEY of electrical equipment at the printing plant of Marshall & Bruce Co., Nashville, Tenn., showed that the switchboard equipment was dangerously inadequate and overloaded; feeder circuits were heating badly due to overloads; insulation was in bad condition.

Installation of a new three-phase, four-wire distribution system made it possible to operate all equipment at top speed, which formerly was impossible. Cost of the new wiring system using improved Anaconda wire and cable was about $1,000. Saving in power losses returned this cost in nine months.

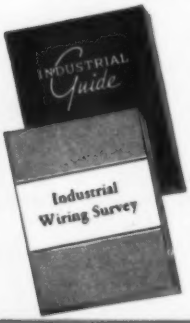
L. C. Hansberger, president, Electrical Construction, Inc., Nashville, Tenn., whose firm installed the new wiring system at Marshall & Bruce Co. The latter firm says: "The electric current saving more than paid for this entire job within a period of nine months."

They turn off dripping faucets—show them how to stop far costlier, invisible electrical leaks!

OVERLOADED electric circuits aren't as easy to spot as dripping faucets—at least not for the nine out of ten plants that estimates show are suffering important power losses from antiquated, outworn circuits. But, you have the equipment and experience to show them where and how inadequate wiring is piling up power expenses.

Remember—nine out of ten plants are prospects. So, use that equipment and experience of yours. You'll be getting three- and four-figure jobs instead of small repair work.

Your Anaconda Distributor Will Help You



The two books shown here can be obtained from your regular Anaconda distributor. They give complete directions about making plant wiring surveys . . . provide a step-by-step guide for making a general survey on wiring, motors and lighting . . . a report section for listing conditions found in each feeder, subfeeder and branch circuits . . . recommendations for plot sketches and plans of existing wiring system layout. Ask your Anaconda Distributor for your copies today. 33316

Anaconda Duracode

Duracode insulation represents the first successful attempt to combat the destructive effect of heat and oxidation with one all-purpose building wire. Write for the facts about this improved industrial cable.

USE MODERN IMPROVED *Anaconda Wire & Cable*

ANACONDA WIRE & CABLE COMPANY, General Offices: 25 Broadway, New York City; Chicago Office: 20 North Wacker Drive

Subsidiary of Anaconda Copper Mining Company. Sales Offices in Principal Cities

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FEBRUARY, 1940

To The Mill Race!

WHEN I WAS A YOUNGSTER in a little Jersey village, we had a grand gray mare. One summer day, she broke out of the barn. We couldn't find her. My father walked down to the store and told the men and boys, there on the steps, that he would pay five dollars to whoever brought her back.

THE VILLAGE HALF-WIT SCRAMBLED UP and said, "I'll find her, Doctor!" Everybody laughed. But before long, here he came with the mare. Father asked him how he found her.

"Well, I said to myself," sezzee, "what would I want if I was a horse. And I went there. And she did."

SOMETIMES I GET TO PONDERING OVER what would happen if, in our selling, we electrical men would use the simple horse sense of this Half-Wit. He just figured that a horse would want the quiet coolness of the willow thicket, near the mill race. But we keep ever thinking like ourselves and going where we like to go—and miss the mare.

RIGHT NOW, THERE IS A CHANCE to sell $300,000,000 worth of electrical equipment annually for ten years to modernize the factories of America. But NEMA, in a recent market study, found that factory managers are quite unconscious of having any "electrical problem" at all. They are not interested in our stuff.

WHY SHOULD THEY BE? Their minds are full of their own affairs—thinking in terms of blankets, canned peas, camp chairs, paper goods or metal parts. And when we come around occasionally, still prattling of kilowatts and power factor and foot candles, they don't buy.

BUT IF WE WOULD TRY this Half-Wit method for a while, it might be different. We would re-cast our selling into terms that do interest and concern these manufacturers. We would talk about *their* problems — and they would listen. NEMA has already proposed a national, all-industry campaign to do this very thing.

WE KNOW RIGHT WHERE THESE FACTORIES ARE. We know what they need. We've got it for 'em. Why don't we quit forever acting like electrical men? Let's go down to the mill race—like a good gray mare. That's where this business is. Why do we wait?

Paul Wheelhouse

GraybaR Specials!

Ask for proof of "plus-value" on these items

Your GRAYBAR Man respects economy-minded business judgment... he's glad to meet up with men who want proof of "plus-value" when they buy. He can supply facts and figures showing the *performance* economy of GRAYBAR-distributed products, and the *service* economy of buying "everything electrical" the GRAYBAR way.

If you're after products that cost the least in terms of long-run satisfaction on the job, you'll find the GRAYBAR Man "talking your language" right from the start. You'll get trustworthy products, prompt service, and frank and competent buying assistance on "everything electrical."

TAPE

There's hardly a thing that costs so little—relative to the job—yet means so much to good workmanship and sound performance as tape! » » » GRAYBAR offers a complete line of friction and rubber tape, made to its special specifications by the world's largest tape manufacturer. For critical work, VIM gray tape or AMAZON (A.S.T.M.) are the choice of firms whose tape needs call for careful buying. For splicing compound (rubber tape) combining maximum s-t-r-e-t-c-h with high insulating quality, AMAZON tops the field, VICTOR offers unusual value. » » » Whatever the service, there's a plus-value GRAYBAR tape—clean, strong, free from pinholes—ready to meet it. Ask your GRAYBAR Man *what to look for in tape, and why.* Or, if you prefer, write for booklet which tells the story.

SILVRAY

SILVERED BOWL LAMP LUMINAIRES

There's "plus-value" for every electrical contractor in the Silvray line of luminaires for stores, offices, public buildings . . . wherever good looks and good seeing are both at a premium.

The new Model 207-PL has a translucent plastic bowl-rim, modern in every detail. Yet test data from Electrical Testing Laboratories show 89.5% light output in terms of clear lamp output. Equipped with 300 or 500 watt silvered bowl lamps, it does the kind of lighting job that "shows up" older units on a cost basis as well as an appearance basis . . . repeat business follows quickly. » » » Also, ask your GRAYBAR Man about the new Silvray Sight-Savers for Light Conditioning the home, and the Franchise Plan that means extra profits on this line.

"When the Graybar Man calls, I can nearly always count on hearing about some new product, or some way of making a saving electrically . . ."

—said Manager T_____L_____

(No. 3 of a series of 10-second quotes from typical Graybar customers.)

GraybaR QUALITY SINCE 1869 *Everything Electrical* GraybaR ELECTRIC COMPANY

OFFICES IN 82 PRINCIPAL CITIES • EXECUTIVE OFFICES: GRAYBAR BUILDING, NEW YORK, N. Y.

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The truth about SEARS and WARD

By Earl Whitehorne

Fear is spreading among electrical contractors that the two great mail order chains intend to steal our house wiring market. But the head men of Ward and Sears say—not so. And a check-up brings interesting evidence.

A GREAT many electrical contractors are worried about competition from the great mail order houses. They are particularly concerned about Montgomery Ward, with its 600 local stores, and Sears Roebuck, with its 500 retail establishments. Here, day after day, wiring materials and devices are being sold to anyone who wants to buy.

These stores spread all over America. And contractors see these wiring supplies on display in these stores at very low prices. They see this wire and cable, these switches, sockets, receptacles and fuses sold to people who take the stuff home and wire up their houses themselves. And they see many other contractors and many free-lance journeymen electricians going to Ward and Sears to buy their materials. And they wonder what's going to happen.

They wonder what will happen if these great national chain houses enter the field and begin to install the materials they sell? And there is widespread conviction that this is impending.

A few months ago, a friend of mine in the Pacific northwest, wrote me that Montgomery Ward and Sears Roebuck were taking out local licenses as electrical contractors and were actively in the house wiring business. He had seen the official list of the State of Washington in which the name of Montgomery Ward & Company appeared as holding license No. 1744, authorizing them to install electric wiring in fourteen cities. He had not yet investigated to see just what it meant, he said, but he was concerned over it.

I had a check made in each of these cities. We found no city where either of these chain houses is now in the contracting business. In some places, It was said that Ward had a license to do work in its own buildings. But in every case, the mail order houses are not in the house wiring business.

They sell lots of wiring materials to farmers and other householders. They sell to many electrical contractors. But when people buy their wire and fittings direct and want somebody to put them in, the store refers these customers to certain local electrical contractors who do the work.

Well, all this was at wide variance with the rumors and the fears that have been piling up in the past year about this threatened chain store competition. I decided to go to Chicago and talk the whole thing over with the heads of the electrical departments of Ward and Sears. Why not?

So I went to Chicago and spent a very interesting day with these two men. I asked them questions and they answered me frankly. They asked me about the feeling of the contractor toward their electrical sales and I told them with equal candor. And I think I got the truth about Ward and Sears, in this matter of their relation to the house wiring business in America. For what they told me checked with evidence I have gathered from their own local stores about the country.

The basic position of both Ward and Sears, I think, can be stated in these four paragraphs--

1. They are in the business of merchandising to millions of customers in America, thousands of articles that people wear and use in their homes and on their farms. They sell from catalogs and from hundreds of stores, on a low price appeal.

2. They sell electrical wiring materials and appliances, because their customers want to buy them. It is just one department. They have no more sense of being in the electrical industry than in the cosmetic or fertilizer industries.

3. They want the good will and friendship of the electrical contractors, because they want our business too. But they are no more concerned with the sentiment of electrical contractors over the fact that they compete in our field, than with the resentment of heating and plumbing contractors because they sell furnaces, bathroom fittings and water pipe.

4. Their chief responsibility is to satisfy their customers, so that they will continue to buy. For their own protection, therefore, they protect the customer by selling only electrical materials and wiring devices that have been approved by Underwriters' Laboratories.

What Ward Really Does

The general policy of the electrical department of Montgomery Ward, as it was explained to me, is as follows:

1. They are pushing the sale of electrical wiring materials aggressively both in the catalog and in their 600 stores.

2. Goods sold over the counter in stores are priced from 5 to 10 per cent higher than the catalog price.

3. A recognized electrical contractor may buy electrical supplies in the Ward stores, at a discount off the counter price, which will approximate the catalog price.

4. If a recognized electrical contractor sells his customer Ward material and appliances and brings or sends the customer to buy them in the store, the contractor receives a 10 per cent commission. They do not encourage this, however.

They find that they get more business if they sell the farmer or the householder themselves. Their own representatives will push not only the electrical line, but also maybe sell him a cream separator and a living room rug.

5. When a customer comes in and wants material to wire his house and barns, Ward will figure out what he requires, make up the list for him and sell him the wire, the wiring devices and the fixtures. They will sell him the material for cash or on easy payment contract.

6. Because Ward does not want to sell a farmer a lot of wire and receptacles and fixtures and have him get in trouble and come back sore, they do two things—

First—They ask the man if he does not want them to send him a contractor to do the wiring. If he says "yes", they give him the names of one or more contractors. These contractors have already been selected by Ward. The local store manager takes the list of local contractors and interviews the best man and then the next until he finds some whom he believes to be capable and responsible, who will do the work for what they can make out of their labor.

If the customer wants Ward to pick a man and send him out to figure on the installation—OK. But this man is not in the employ of Ward, and makes a separate contract with the customer for labor only.

Second—If he wants to do his own installing, Ward sells him, for 25 cents, a paper covered book entitled—*"Wiring Simplified"*—by H. P. Richter, manager of Ward's electrical department. In the preface is this statement—

"Electrical wiring cannot be learned by skimming through this or any other book for 15 minutes, but careful study of this book together with investigation of such local ordinances as there may be, and observation of local customs, should enable anyone to make an installation in a residence or farm, acceptable to everyone concerned. However, before doing any wiring, learn how to do the job correctly, or hire an electrician who knows how."

The book then proceeds in simple language and many diagrams and pictures, to give the amateur the step by step story of how to install electrical wiring, so that it will pass inspection.

It is a good book and it has two purposes. If the farmer goes ahead and does the job himself and is a good mechanic and follows the book carefully, his work will probably pass and he will not blame Ward for letting him get into something he could not swing. But the intricacy of electrical work is not belittled.

The usual effect is to convince the customer that he better have a contractor install the material. And the book really has its greatest value here, in protecting the customer from getting in over his head.

7. If the customer wants to include the installation cost under the easy payment contract, Ward will do so and pay the approved contractor 75 per cent of his bill on completion of the work and the balance when the inspection certificate is issued. But the contractor is solely responsible for satisfying the inspector.

8. Materials left over after the completion of such a contract job remain the property of Ward and are returned. The contractor receives no commission on the material, when the customer buys it direct.

I asked if any of Ward's local managers have taken out contractors' licenses and have their own men installing wiring. They showed me a general letter sent to all managers. It is headed—"Warning!" and says—

"Wards are *not* in the *electrical contracting business.* We have not the slightest intention of getting into it.

"We *do* intend to sell substantial quantities of wiring materials. We do intend to help the customer to secure competent labor at an attractive price. We will even help the customer finance the labor as outlined on previous pages . . .

"We *cannot* have electricians on our own payroll—we *cannot* become contractors."

The Sears Sales Policy

The head of the electrical department of Sears Roebuck was no less frank and definite. Sears merchandising policy is similar to that followed by Ward—

1. Buyers of wiring materials, who want someone to install the stuff, are put in touch with an approved man. He is usually a contractor who buys his own supplies regularly from Sears.

2. Only material is sold under term contracts. The contractors charge for installation is not included—at present. There is no commitment as to the future.

3. Stores allow a discount to contractors who use Sears material and furnish them with discount cards.

4. Sears also publishes a book that tells the customer how to do his own wiring.

Sears local managers are not author-

(Continued on Page 21)

Repairing an Electro-Magnet

EMPTY CASE *of the magnet after the old copper has been removed. Magnet base with new coils is bolted to this shell.*

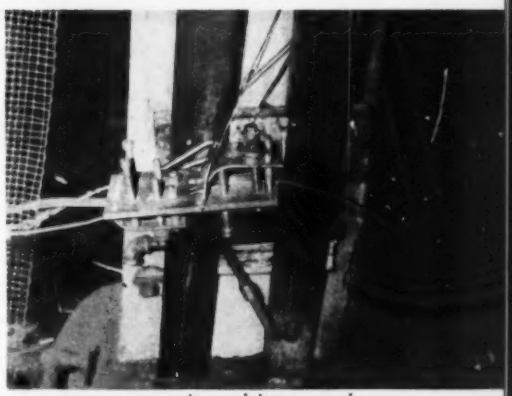
How this motor shop handles the re-wiring of a large lifting magnet.

REPAIRING electro-magnets is a part of the daily diet of Goodman and Pray, Inc., an electric motor repair shop in Newark, N. J. And they do it in a big way. Recently a 65-inch magnet weighing approximately three tons was repaired in their shop. Now they are putting the finishing touches on a 55-inch magnet weighing 5,700 pounds.

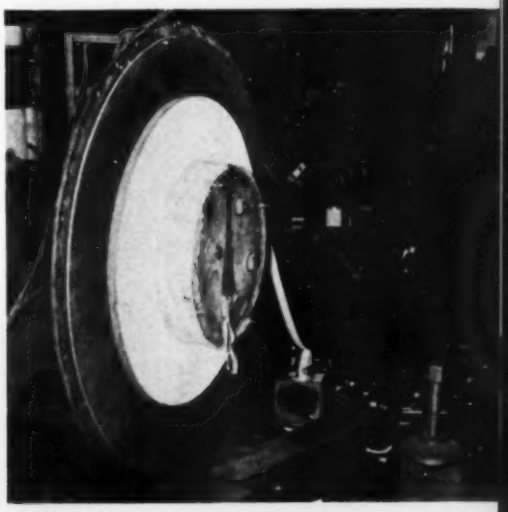
When the magnet came into the shop the first step was to strip it of its old copper. As much as possible of this copper was salvaged and cleaned for reuse in the rewound magnet. To do this the magnet is supported by a swivel joint on a travelling crane. The copper is unwound from the magnet, passed through a "stripping gadget" and wound on a spool set up in a lathe. This stripping gadget, developed by Goodman and Pray, Inc., strips the insulation from the copper and irons out the waves in it, all in one operation.

The new copper coils are wound next. To do this, the base plate of the magnet is set up in a lathe and the coils wound on it. This 55-inch magnet required four "pancake coils" made of rectangular copper ¾-inch wide and .034-inch thick. Each pancake coil was 47-inches wide. These four coils took a total of 900 pounds of copper. Mica and asbestos rings insulate the coils from the base and mica rings separate the coils. Asbestos tape insulates concentric rings of the coils.

After the coils were wound the magnet was assembled and placed in an oven for 24 hours at 300°F. After it was taken from the oven it was filled with 40 pounds of heated compound. Tests and finishing touches were then made and it was ready for shipment to a customer in Canada. In the meantime work was being done on a smaller magnet requiring round wire.

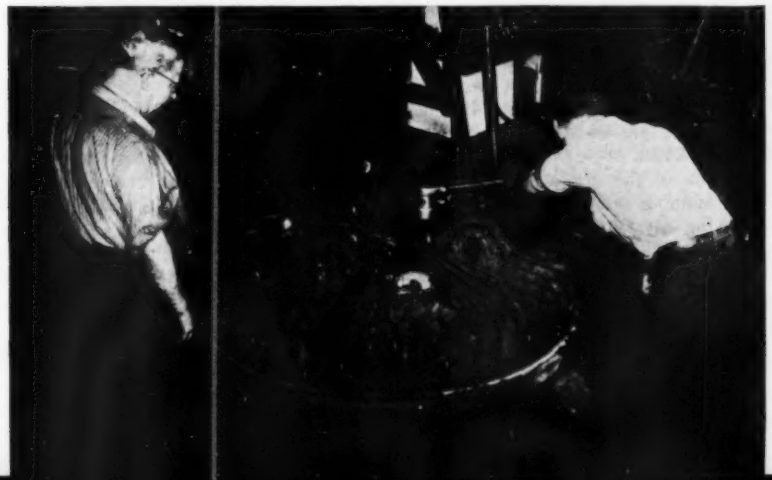


STRIPPING GADGET *strips and irons out the copper in one operation. Copper fed in at left is wound on spool at right.*



PANCAKE COILS *are wound on the magnet base. Asbestos tape layer separates concentric rings.*

CHECKING UP *on assembled magnet before it is placed in the oven for heating.*



OLD FRONT—*Here is Stonebraker's store in East Cleveland before it was modernized with light.*

NEW FRONT—*This transformation has brought Stonebraker a gain of 10 per cent in gross business.*

Does Luminous Advertising PAY?

New luminous store front meets new competition and increases sales.

By Dean M. Warren
Nela Park, Cleveland, Ohio

LUMINOUS advertising is an effective means of selling a store and its services to the buying public. This has been proved by the case of C. S. Stonebraker, an East Cleveland, druggist. Troubled with competition, this druggist modernized his entire store front as shown by these before and after photographs. The work was done by the Liberty Electric Co. Public response was immediate.

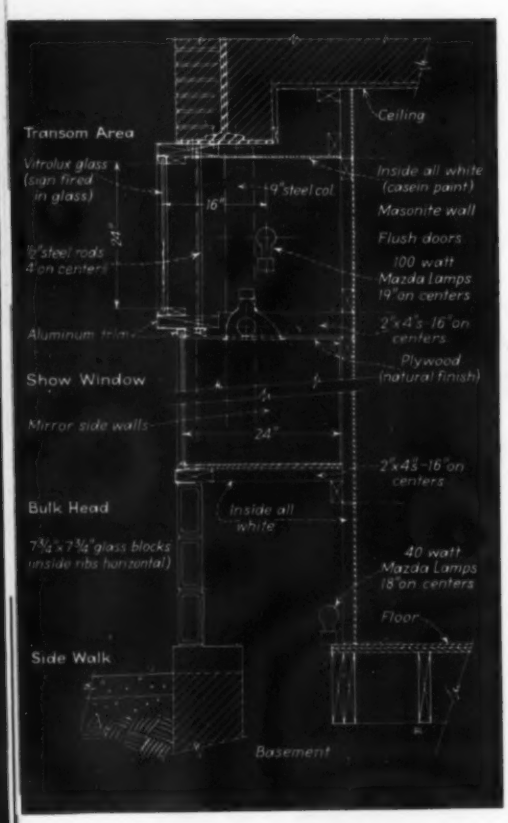
The new front is a combination of enameled tempered glass and glass blocks. The fascia panel sign and drug sign is vitrolux glass with letters in color. The drug sign has four luminous faces in red crosses and blue letters. The bulkheads and glass entrance framing are $7\frac{3}{4}$ inch (Insulux) glass blocks with $\frac{1}{2}$ inch flutes. The trim is blue agate vitrolite glass and the metal mouldings are of aluminum with aluminite finish.

Some of the details of construction and lamping are shown in the accompanying drawing. Fifty-eight lamps, totalling 5010 watts, are used. The two-foot fascia sign is lamped with twelve 100 watt lamps, backed by a white enclosure. Access is from the store. The lamps are on 19 inch centers, 16 inches back of the glass.

The cased opal glass soffit has three 150 watt lamps and the entrance framing ten 60 watt orange lumiline lamps. The bulkhead, also backed by white enclosures, house fifteen 40 watt lamps on 18 inch centers. The small drug sign has six 60 watt lamps. Twelve 150 watt lamps are used in the show windows.

Mr. Stonebraker says, "Our new luminous store front has exceeded our expectations. In spite of new competition nearby, I estimate a gain of about ten per cent in our gross business can be attributed to the outstanding nighttime appearance of our store. That show windows are now more effective is indicated by larger sales on articles given street display and the comments of our customers.

"While it adds about 60 cents a day to our electric bill, I consider this an advertising charge, rather than overhead, and a very low one considering the good day and night appearance of the front, which is seen by thousands of people."



CONSTRUCTION — *How the new equipment making Stonebraker luminous front was installed by the contractor.*

UMI

Understanding Industrial Control . .

There is no mystery in control. The purposes are simple and various simple methods are used to accomplish these definite results. So Mr. Yates reviews these methods and makes them plain.

By W. C. Yates,
Manager, Control and Renewal Parts Division, Industrial Department General Electric Company, Schenectady.

THERE has been rapid evolution in the art of control for industrial motors. Strides have been made in convenience of installation, operation and maintenance; wearing qualities and dependability; and protective features, involving safety to motor, operator, the driven machine and the material in process. But all this does not justify the prevailing belief that motor control is a complex subject beyond the understanding of anyone but a specialist in that field.

To select a suitable motor, consideration is given to load, power supply, speed, duty cycle and any peculiar conditions such as temperature, dust, moisture, gas. The selection of the controller involves these factors together with the responsibility for starting and stopping the motor and providing speed control or reversing when required.

The controller must also provide protection to the motor against overload and usually affords undervoltage protection, so that after voltage failure the motor cannot automatically restart when power returns. Some controllers for special service may incorporate other protective features but these are of interest only to experts.

Constant Speed Motors

Most application requirements are met by constant-speed motors and most of them are polyphase a.c. squirrel-cage motors that can be connected directly to the line. For these "full-voltage" starting is employed. And today any size squirrel-cage motor that the power line will carry can be thrown directly on the line.

In the old days fused knife switches were employed to start small induction motors. The fuses guarded the circuit against shorts but the motor received little or no running protection. The latest types of manual starters employ switches designed for frequent operation and held closed by a latch or toggle. The overload trip thermostat is actuated by a heater coil in series with the motor. (photo 1)

Now magnetic starting switches are becoming increasingly popular. They employ a magnet to close the switch and a "start" push button to energize the magnet. When the switch closes it makes an auxiliary contact that keeps its magnet energized after the "start" button is released. Pushing a "stop" push button opens the magnet circuit and the switch drops out. Should power fail, the switch opens and cannot reclose until the "start" button is again operated.

Such magnetic starters are available for various motor ratings and in different enclosures. They come in combination with line switches, fuses, or circuit breakers. But this means merely the incorporation of line protection in the box with the starter, as an installation convenience. The starter proper still comprises the magnetic switch, overload relays in two of the legs of the circuit, and a push button station. The relays utilize a thermostat and heater coil and contacts that open the circuit to the switch magnet.

Such a basic starter can be supplied with various attachments and auxiliaries but they are all simple to understand and properly select. Some examples are—

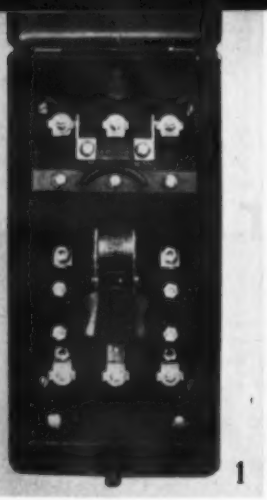
1. A number of "start-stop" stations can be employed, with their "start" buttons wired in multiple and the "stop" buttons in series, to start and stop a motor from as many points. (Photo 2) Any station can be provided with a lock and key to prevent operation from that or any other station. Distant stations can have indicating lights to denote whether the starting switch is "in" or "out."

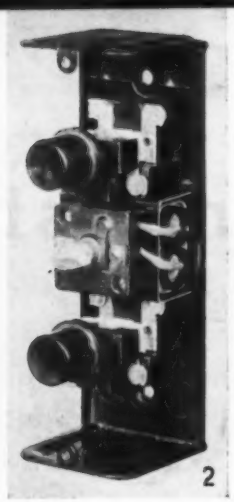
2. Limit switches for attachment to the driven machine are available to open the control circuit at any position or point of travel desired. (Photo 3) Float switches operated by changing liquid level, pressure switches responding to gas or liquid pressure and thermostats affected by temperature can be utilized to start and stop the motor through the magnetic switch. A photoelectric relay can serve for counting, sorting, or selecting operations.

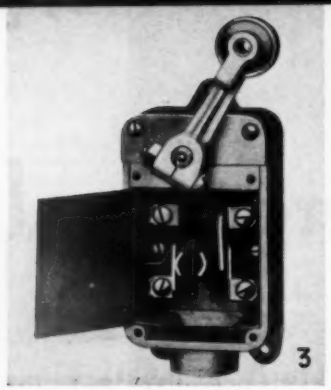
Polyphase Squirrel Cage Motors

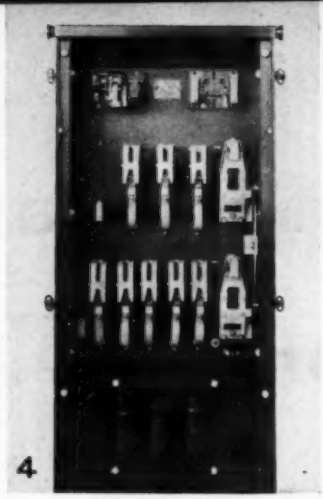
In starting polyphase squirrel-cage induction motors too large for throwing directly on the line, some "reduced-voltage" means must be employed to limit the inrush current. Reactors are employed occasionally and additional switching devices are necessary, depending upon the number of steps in which the resistor is cut out of the circuit. Auto-transformers or "compensators" are cut out in one step. Both are ordinarily adjustable for the desired reduced voltage. (Photo 4)

Now what does all this add to our original simple control, that is difficult to understand? In the case of manually operated starters, the additional devices









1. MANUAL MOTOR-STARTING *switch with thermal overload protection.*

2. TYPICAL START-STOP *pushbutton with indicating lamp.*

3. LIMIT SWITCH, *lever-operated, for actuating a control circuit.*

4. MAGNETIC AUTO - TRANSFORMER *starter with overload and under-voltage protection—cover removed.*

take the form of extra fingers or other type contact. In magnetic control, they become additional contactors which are energized by relays to function at the proper time. These timing relays may consist of a small motor and a train of gears, a solenoid pulling against the retarding action of a dash-pot, or some other time-lag mechanism.

We will have covered our polyphase squirrel-cage motor control quite thoroughly when we deal with reversing and quick stopping. Here an additional multi-pole switch provides for reversing. (Photo 5) But care must be taken to interlock magnetic reversing contactors so that both cannot be closed simultaneously, and an extra push-button is needed in the control station. A solenoid brake takes care of quick stopping. It consists of a brake wheel keyed to the motor shaft and a set of shoes that are spring applied and lifted by a solenoid. When the circuit to the motor is closed, the solenoid is energized, releasing the brake. When power is thrown off, the springs set the brake and the motor is quickly stopped. For emergency stopping, the motor can be "plugged," by connecting for reverse rotation until it comes to rest.

For certain drives, where two to four different running speeds are required, induction motors are available with windings so arranged that various groupings of connections will provide the several speeds. The controllers for such motors must take care of the grouping of the motor connections. This means that the manual control usually takes the form of a drum switch with sufficient fingers and segments for the purpose, and the magnetic control must have the requisite number of multi-pole contactors.

Single Phase Motors

Single phase motors for general use are of the "self-starting" type and usually can be connected directly to the line without objectionable voltage disturbance. In sizes and for applications requiring more than an ordinary snap or tumbler switch, single-phase motor starters, both manual and magnetic are like those employed for polyphase motors. The difference is only in the number of poles required in the switches (two for single phase; three, occasionally four, for polyphase) and the legs of the circuit in which overload trips or relays need be inserted (one for single phase, two for polyphase).

Synchronous Motors

When we come to the control of synchronous motors it may appear that we are getting involved. But the control is not hard to understand, even though it does include certain unique features resulting from the need of applying field, when conditions are right, and removing it when the motor is being pulled out of step. (Photo 6)

Synchronous motors start as induction motors and are thrown on the line or started by some reduced-voltage method—usually an autotransformer. The starter may be manual or magnetic. In either case, the closing of the motor field circuit is accomplished automatically by a relay, which may function in a definite time, or in response to some changing condition of frequency, current, or impedance in some part of the motor winding. There are many schemes for closing the field at the right time.

The field-removal feature is also achieved through some changing condition that develops in the motor when dropping out of step. When this happens and it is anticipated that the motor cannot re-synchronize its load, some controllers disconnect the motor from the line.

Wound-Rotor Motors

When we include the wound-rotor motor in this discussion, we have covered all types of alternating-current motors that have general application. This type of motor is not now so widely used because of the improvements made in the starting of squirrel-cage motors.

The wound-rotor motor permits external control of the current induced in its secondary winding (the rotor). Such control provides for best torque at minimum line currents and makes this motor logical on intermittent service such as for cranes and hoists. The secondary control also permits of speed adjustment.

Our controller then is a dual affair having a switching device in the primary, or line circuit, which may be a circuit breaker, a contactor or contacts in a drum- or dial-type switch. (Photo 7) In the secondary circuit, the controller provides resistors which are cut in or out in one or more steps by additional switching devices, which may be additional contactors or more contacts in the drum or dial switch.

With magnetic control of wound-rotor motors, line contactors providing for motor reversal and secondary contactors can be actuated through a hand-operated master switch, as is often done for cranes. (Photo 8). If the control is from push button, pressure governor, or other pilot switch, the accelerating contactors that cut out the secondary resistance are brought into action through accelerating relays.

When a motor is brought up to speed through one or more steps of resistance in the circuit, the manual controller will have the necessary contacts, such as fingers and segments. The magnetic

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controller will ordinarily provide for automatic acceleration by one of several available methods, usually "definite-time" and "current-limit."

Of course, there is more than one way to secure a definite time between the closure of one contactor and the next. Dash pots, ratchet mechanisms, telechron movements, magnetic time lag and other devices are employed. Magnetic time results from retarding the dissipation of a magnetic field by inserting a copper ring. Just why this works is not so important as the fact that it does.

"Current-limit" acceleration is secured by relays which respond to the decreasing draft of current as the motor speeds up. They function in the primary circuit of a squirrel cage motor, the armature of a direct-current motor, and sometimes in the secondary circuit of a wound-rotor motor.

Direct Current Motors

Control devices and equipment for d.-c. motors ordinarily involve more than is required for a.-c. motors. Of course, small d.-c. motors that may be thrown on the line need no more control than a single-phase motor. But d.-c. motors, even as small as those of fractional-horsepower ratings, often require resistors to hold the starting currents down to safe values for commutation. (Photo 9). On the other hand, switching devices for d.-c. controllers are ordinarily single-pole, or at the most, double-pole; whereas for polyphase a.-c. motors they become three-, four-, and even five-pole.

A constant-speed d.-c. motor in sizes up to 40 horsepower, or even larger, can be started by a dial-type resistor starter, the arm of which is held in the running position by a magnet. Should power fail, the magnet releases the arm which is returned by a spring to the "off" position. Ahead of such a starter is usually installed a line switch with fuses or a circuit breaker, either of which affords adequate line protection and disconnecting means.

Magnetic starters for d.-c. motors may employ a series of solenoid operated contacts in the smaller sizes, but in general they utilize contactors to cut out the resistance steps. The same push button stations, limit switches, pressure switches, and other pilot devices used with a.-c. magnetic control are just as useful with d.-c. Overload protection is secured through overload relays that function to de-energize the line contactors.

Any further consideration of control for d.-c. motors gets us into the realm of special service, such as adjustable-speed motors for intermittent duty on cranes, hoists or steel-mill devices. Only a specialist is competent to select the equipment just right for the job; but, having determined the duty cycle and picked out a motor of suitable characteristics and rating, his control problem is simple. The adjustable-speed motor requires a rheostat in its shunt field and the intermittent-duty motor requires correctly proportioned resistors in its armature circuit.

Where d.-c. motors must be quickly stopped, there are two braking methods available. One is the solenoid brake already described for a.-c. motors. The other is "dynamic braking." This is a scheme of connections that causes the motor, when disconnected from the line, to act as a generator pumping into a resistance load across its terminals. Its own inertia or that of its driven machine won't let it run long under such conditions. The stored energy of rotation is quickly dissipated as heat in the resistor. Incidentally, dynamic braking is possible with synchronous motors and occasionally employed.

No Mystery

Anything is mysterious to one who does not understand it. But anyone whose interest is limited to a.-c. squirrel-cage motors of around 10 hp. and smaller, need know only that if connected to the line it runs and when disconnected it stops. It seems desirable, however, that more than this should be understood by one whose responsibility it is to select or offer control for even simple motor applications.

Fortunately, a working knowledge of the characteristics and capabilities of general-purpose motors is easy to acquire. The same is true of the features that the control must possess to put the motor through the desired performance and adequately protect it. It remains then to give consideration to the safeguarding of the operator and finally recognizing the conditions surrounding the installation. For if an ordinary enclosing case will not afford adequate protection against unusual conditions of dust, wetness, gaseous atmosphere, or what not, the proper enclosure must be selected.

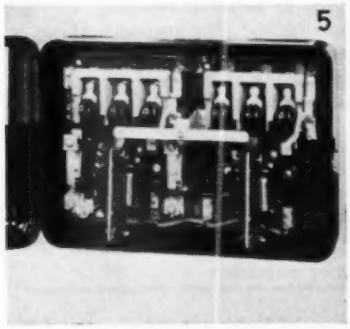
5. MAGNETIC REVERSING SWITCH, *full-voltage, with overload and undervoltage protection for small induction motors.*

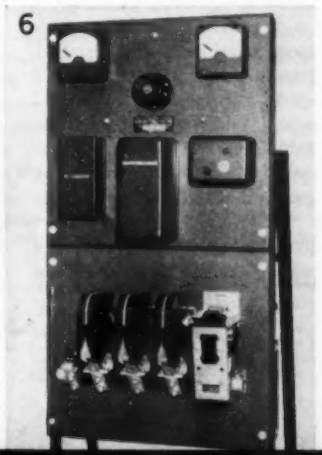
6. SYNCHRONOUS-MOTOR CONTROLLER, *magnetic, full-voltage, overload and undervoltage protection, automatic field control.*

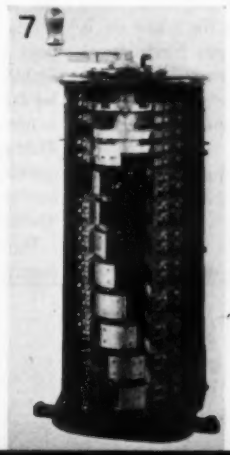
7. MANUAL DRUM-SWITCH *for secondary control of wound-rotor motors.*

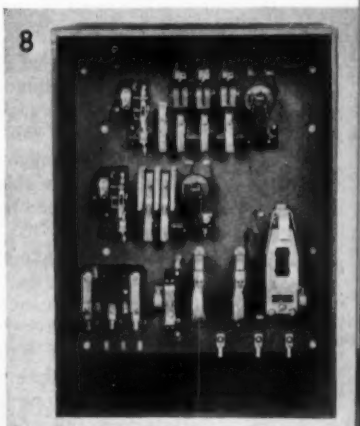
8. MAGNETIC STARTER *with overload and undervoltage protection for wound-rotor motors.*

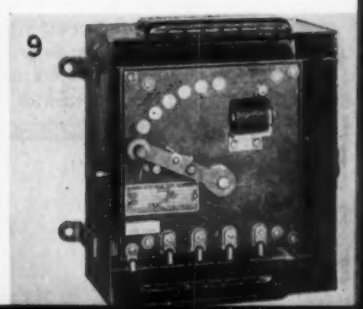
9. MANUAL STARTING RHEOSTAT *with undervoltage protection for small d.-c. motors.*











CRITICAL CONDITIONS *in the photography room of engraving plants require adequate copper, close control of voltage and freedom from vibration for long exposures.*

MACHINE WIRING *runs to small units like this proofing press. Convenient controls, trouble-free power circuits and correctly positioned lighting facilities are important.*

When You Wire a

THE increased popularity of illustrated reading matter is evident when you pick up almost any magazine. And this applies as well to all sorts of advertising folders or booklets. To produce this tremendous flood of pictures and decorative matter for the printing presses has brought a steady growth to the photo engraving and electrotyping industry. Wherever illustrated printing matter is produced some amount of engraving is required. Production is either within the plant or is supplied by separate shops. Each larger community has one or more engraving plants doing this work for various printing concerns that are not equipped for such work.

The production procedure involved in the engraving shop involves a series of departmental operations. Each requires particular attention to illumination, since critical seeing tasks abound all along the line. So the general lighting must be supplemented by local units adapted to each kind of machine or bench work. Adjustable lighting must be made rugged to withstand constant use and rough handling.

In the power wiring, there are no large motors or complex controls. The usual requirement is for freedom of individual operations, with step-saving pushbutton controls used to simplify frequent starting and stopping. So the motor wiring and control equipment must help conserve time for skilled mechanics, who operate their machines intermittently. The plant cannot afford shutdowns, balky starters nor circuits that must be humored to carry the load.

The production layout for the camera room, etching, finishing, routing, proving and blocking operation is usually a series of equipment units. When business increases more units are installed. So the original wiring system should be laid out to accommodate additional motor circuits and lighting facilities. Taking load diversity too much for granted spells trouble when a rush in business puts all machines into steady operation.

Particular care must be exercised in routing wiring to etching machines. Here destructive acid solutions are in constant use, and all metal must be asphalted for protection against damage. Strict regulations govern the working conditions in these rooms subject to acid fumes. Thus an adequate system of ventilating ducts must be provided, with convenient controls for their motors.

Here then is an industry requiring high grade electrical facilities for a variety of precision machines. The layout must assure freedom from shutdowns and convenient use of each unit at any time. It means carefully planning the lighting system to provide outlets at the desired positions, and with handy control. The selection of motor and control equipment should make it trouble-proof and easy to maintain.

Existing plants often provide opportunities to increase efficiency through improving the illumination. Haywire extensions and crippled starters are also often found, as a result of additions made to production without proper wiring facilities provided. As a guide to planning new installations, and to check old ones, we present the following listing of wiring reminders. Use this information in plant surveys as a basis for compiling your list of what is in need of correction.

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MASKING OPERATIONS *depend on high intensity lighting at just the right angle. Other places in the plant have similar needs*

an Engraving Plant

Tenth article in a series of wiring reminder lists devoted to specific types of customers.

CHECK LIST FOR PHOTO ENGRAVING AND ELECTROTYPING

Motor Driven Equipment

Agitators
Air compressors
Battery charging sets
Bevellers
Black leaders
Brush wheels
Building tools
Circular saws
Driers
Drills
Drying fans
Electroplating equipment
Electrolyte
Electrotype bath
Etching machine
Fans, ventilating
Grinders
Heating plant equipment
Machine tools
Matrix rollers
Molding presses
Mortisers
Motor-generator
Nailers
Pantograph
Plate benders
Printing frames
Proof presses
Refrigerator
Roughers
Routers
Saws
Scorcher
Shavers
Stylus
Sweating machines
Tacking machines
Trimmers
Unit heaters
Water coolers

Electrically Heated Devices

Branding irons
Glue pots
Melting pots
Negative driers
Soldering irons
Solder pots
Water heaters
Wax melters

Plant Signals

Annunciator
Burglar alarm
Code calling
Fire alarm
Temperature alarm
Telephones
Time clocks
Time stamps
Vault pilots
Watchman system

Lighting Equipment

Arc lamps
Exit lights
Flood lights
Night lights
Signs

General lighting of good quality should range from 20 to 25 footcandles. Supplementary lighting of 100 footcandles needed at various operations involving critical seeing. Use wide area diffusing light sources at bench work for masking and re-touch work.

Air Conditioning ....What's in it?

By Stephen J. O'Brien
President, S. J. O'Brien Sales Corp., New York City

A bit of frank advice from an electrical contractor who has developed air conditioning into a very large sales and maintenance business, tied into a regular contracting operation.

IT is admitted that air conditioning is one of the coming industries. If that is fact, the electrical contractor should start now to get his house in order so as to be able to go after this business. If he does not, it may soon be too late. The steam fitters and duct men recently tried to pass legislation in New York State giving them full control.

A few years ago, when air conditioning was built up around large ammonia plants, there was little question about this specialty being someone else's. Electrical men could not handle it because the work consisted mainly of the installation of piping all the way from the ¼ inch to 3 inch or larger. But there's been a change in the picture.

Today there are almost as many electrical controls on a good air conditioning system as there are on one of the new clipper ships. So where does the plumber and steam fitter fit in? And the trend in units is toward the hermetically sealed type. This means that the principal work is electrical, having to do with controls and wiring.

In the old days when you put in a designed job, about 20 per cent of it was equipment and 80 per cent wiring, piping ducts, which could never be used again in case of a repossession. Therefore, your credit had to be very strict. With the package unit, 85 per cent of your cost is in one unit which you can carry out like a household refrigerator or a radio, if you don't get paid. And only 15 per cent is in wiring or piping. So it has become a far more attractive business to the contractor.

In 1936, about 86 per cent of all air conditioning jobs were special jobs. They were what we call engineered jobs and only 14 per cent of the business consisted of the so-called portable units. In 1937, there were twice as many air conditioning jobs installed as there were in 1936. But there was a gain of 93 per cent in the number of unit installations. In 1938 there was a little falling off in total volume. Only about 98 per cent of the 1937 volume was sold. Yet units gained 91 per cent over 1937. And the same trend continued in 1939.

What I am trying to point out is that unit installations are doubling every year. And designed jobs are growing steadily fewer, in the broad field of air conditioning that the electrical contractor is interested in.

But it is not a business that any electrical contractor is going to make a fortune at without work. And don't try to go into it as a separate business. You can't make money in a business that requires a force on hand 12 months of the year, but only produces for 3 months.

The summer months are usually the slowest in the electrical contracting field. Air conditioning offers a profitable activity for this period and you can train your force to pick up this extra summer load. Your regular electricians can do the installation and service work. Then, when the day comes that 95 per cent of the offices in your city will be equipped or clamoring for air conditioning, you will be in on the ground floor.

Of course, air conditioning, as yet, has not been accepted by the public. It is considered a luxury in the home. It is something your competition forces you to buy for your store. But the time is coming when you won't live in a house or have an office that is not cooled in the summer, any more than you would live in a house or store or office that is not heated in the winter. It is estimated that in 1939 unit jobs will equal the total sales of all air conditioning sold in 1936.

It is this continuing trend that is bringing the electrical contractor steadily deeper into this market and this specialty. For the unit job today is just a package containing motors, blowers, refrigerating unit and controls. And to my way of thinking, it is now about 95 per cent an electrical contractor's job. The only outside work is the water supply, the drain and possibly a little air duct construction.

The time has come, therefore, when every electrical contractor should give some thought to what part he wishes to play in this growing field. Either he wants to participate or he does not. But if he does, he must decide soon or it will be too late. For to take on this business calls for considerable preparation.

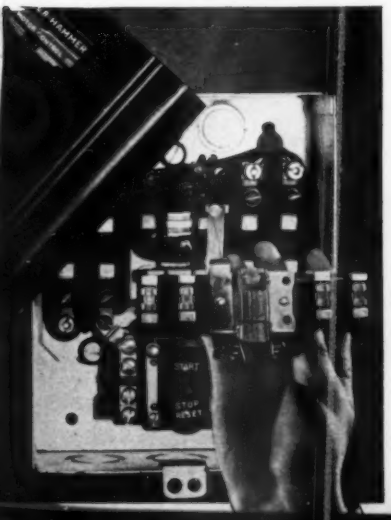
The average job runs about $400 per hp. up to 3 hp. and about $300 per hp. up to 10 hp. But first, you have to sell it and then you have to engineer it.

There are also many problems encountered in the handling of such a job, involving water supply, electricity, air distribution and heat load. But it's still predominantly an electrical job, and remember, air conditioning is fast replacing straight ventilation and, therefore, affects a field that we have long been operating in.

So, I say again, it's the electrical man's job—because he has the capacity, the ability and the nerve. If he didn't, he wouldn't be in the electrical contracting business.

The DUST problem

must be solved by the *builder* of your Motor Control



. . . or not at all

Unless the contacts of Motor Control are kept clean you are going to have trouble. Anyone knows that. And anyone who has ever looked inside a Motor Control enclosing case knows it isn't practical to dust off and scrub contacts . . . even if you were willing to spend time and money doing it. So the *dust problem* must be solved by the Motor Control builder—not the user.

Cutler-Hammer engineers realized this years ago and designed *vertical* contacts that *can't* collect dust and grime, that *stay* clean, that last longer, that work better. If you want greater dependability, better performance and lower maintenance in Motor Control you must *insist* on vertical contacts. You do this automatically when you standardize on Cutler-Hammer, the Motor Control that uses *vertical* contacts exclusively. Specify Cutler-Hammer and see the difference. CUTLER-HAMMER, Inc., *Pioneer Electrical Manufacturers*, 1306 St. Paul Avenue, Milwaukee, Wisconsin.

CUTLER-HAMMER
MOTOR CONTROL
C-H

Insist on Dust Safe VERTICAL *Contacts*

Announcing a

DILEC Wires and Cables present these outstanding advantages

A NEW, FIBROUS COVERING The revolutionary new fibrous covering that encases the rubber insulation is composed of a series of cotton yarns laid side by side in contact relation, overlaid by a special rayon binder thread. It provides practically 100% coverage of the rubber insulation as compared to about 60% coverage provided by the braided type.

SMALLER OVERALL DIAMETER This new fibrous covering used on "Dilec" wires and cables eliminates the thread crossovers which are necessarily present in braids. The overall diameter of the finished "Dilec" wire is two thread diameters smaller than braided type wire.

DILEC IS FREE SKINNING The smooth, even payoff of the yarn on the new machines used in covering "Dilec" wire makes possible accurate tension control. This assures uniform compression on the rubber insulation resulting in uniform controlled free skinning.

DILEC FISHES EASILY The new type covering on "Dilec" wire eliminates all hills, valleys and holes found in the braided type. This results in a more uniform surface on which to print permanently the trade name "Dilec", the manufacturer's name, type, size and voltage of the conductors, and a measure marker every two feet.

DILEC IS SAFECOTE PLUS This smaller diameter, flame retarding, moisture resisting, slick finish wire has all of the qualities of Safecote which wire has demonstrated its superior fishing qualities by test and in actual use of many millions of feet.

SAFECOTE

600V 600 600V MANUFACTURER'S NAME

GEORGE C. RICHARDS, Licensors' Agent 155 E

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a New Service

DILEC ... the organization back of this trade name

All electrical conductors branded with the trade name "Dilec" are manufactured to definite specifications under the strict supervision of the "Dilec" Service Organization.

All "Dilec" products are branded with a permanent mark along the full length of the conductor. This branding, facsimile of which is shown here, must give—in addition to the trade name "DILEC"—the manufacturer's name, the type, the size and the voltage. A length-mark, to facilitate measuring, appears every two feet.

The trade name "Dilec" is assurance of rigidly maintained high standards. It is a mark of responsibility. It is symbolic of the obligation on the part of the manufacturer that all electrical conductors so labelled by him are made and tested to the exacting "Dilec" specifications.

DILEC

The Mark of Responsibility

DILEC R 600 V 14 B&S MANUFACTURER'S NAME

155 EAST 44th STREET, NEW YORK, N.Y.

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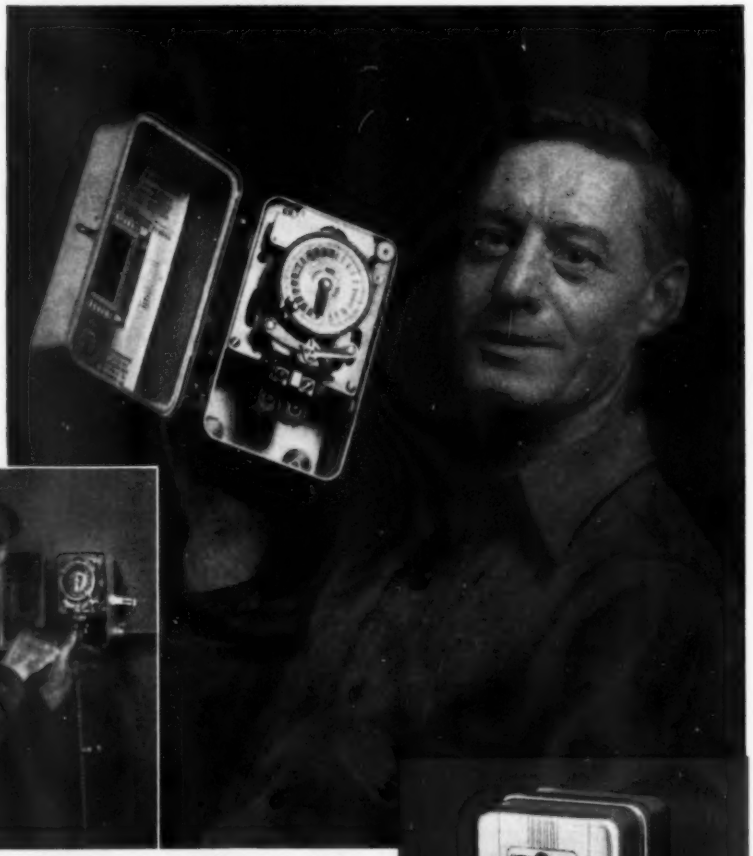
See how simple this New Switch is!

Type T-44 General-purpose

THIS new time switch is the smallest, simplest G-E time switch you've ever seen. It's a brand-new switch, for use indoors or outdoors, and although it is lightweight and housed in a smaller, more attractive case, it offers you that most important of contractor advantages—



Quick, Profitable Wiring

When it comes to wiring the switch, the new Type T-44 has these advantages — plenty of wiring room beneath the terminal block, five standard knockouts, and clearly indicated connections. These simplify your job, eliminate work. Furthermore, the switch is hinged at the side, can be held with one hand. You can install it fast—and then you can forget it, for it's built for service.

It's a simple matter to make connections to this switch. And it's easy to set the time after it's mounted

The new Type T-44 is exceedingly simple. There are fewer parts to wear, fewer places for trouble. It is provided with a reliable electric drive—the well-known Telechron motor. And its silver contacts are conservatively rated at 35 amperes.

In short, here's a new time switch that makes every installation a profitable job for you. To find out more about it, ask for Publication GEA-1427K at your G-E office or write General Electric Company, Schenectady, N. Y.

The sturdy, weatherproof case houses a mechanism that is simple in design, reliable in operation

GENERAL ELECTRIC

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The Truth About Sears and Ward

[FROM PAGE 8]

ized to take out contracting licenses or to hire wiremen to install materials for customers. But Sears feels free to do so, should electrical contractors or inspectors in any community attempt to restrain people from buying Sears products. However, they do not desire to enter the contracting business.

There have been many stories bandied about. I have heard on occasion that Ward and Sears were hiring wiremen and laying waste some rural area with cheap wiring. I have heard that inspectors, in certain sections, were refusing to pass jobs where the material was bought from Ward or Sears. This despite the fact that their stuff all bears the Underwriters' Laboratories label. I have run down some of these stories and have not found facts to support them. Always it turns out to be a rumor based on some contractor's fear that the mail order chains are trying to destroy our business. Or, it springs from the anger of some local store manager, who believes that the electrical men are ganging up to hurt his business.

But where jobs have been turned down, it has been because of poor workmanship or wrong selection of materials, not discrimination against Sears merchandise.

The Threat Remains

On more than one occasion, I have said that if the electrical industry does not itself lift the house wiring business up out of the gutter and put it on a sound basis of adequacy for the customer and profit to the contractor, Ward or Sears or somebody will come along and set up a chain of wiring shops and take the business away from us. I still say so. For America must be rewired and it is a tempting market.

But we can keep it for ourselves, if we will organize to do it on a mass production basis. And with standardized materials and tools and methods, we can do it at low cost with a good profit. But it won't wait for us forever.

At the present time, however, I do not believe that either Ward or Sears is interested in this idea. They are not in the contracting business. And if you find any local manager who talks or acts otherwise, I suggest that you write to the management in Chicago and ask —"How come?"

You'll sell Lighting Equipment FASTER if it's MILLER - IVANHOE!

Miller-Ivanhoe "engineered efficiency" in all types of lighting simplifies your selling . . . makes it possible for you to assure new high standards of service. No matter what problems arise, in industrial or commercial lighting, Miller's nationwide distribution makes available to you dependable *engineered lighting* service *where and when you want it.*

It's this Miller efficiency that gives you a *marked advantage* in selling . . . gives your customers the *marked advantage* of having the *finest* in lighting equipment. No matter what your customers seek in lighting service—a single department or better lighting for a whole industrial plant—*put your problems up to Miller!*

Miller Scores With New Fluorescent Daylighting!

Miller-Ivanhoe Fluorescent fixtures are designed to give you the *full* benefits of sensational new Fluorescent Mazda daylight lamps. Through highly specialized engineering, Miller Fluorescent equipment can handle any lighting problem adaptable to this remarkable light source.

Complete, Dependable Selling Help

With its highly efficient distribution facilities, Miller supplies complete catalogs and sales tools for the contractor . . . a rounded-out lighting service that will *sell* and *re-sell* for you. And the number and character of our installations for industry is a testimonial to Miller leadership in every form of commercial and industrial lighting.

There is a Miller-Ivanhoe distributor near you. Phone him or write us for information.

IVANHOE SINCE 1844 LIGHTING • MILLER • EQUIPMENT MERIDEN, CONN., U.S.A. DUPLEXALITE

THE MILLER COMPANY
MERIDEN, CONN.
Pioneers in Lighting Since 1844

Earl Whitehorne, Editor

Non-Tamperables Next Year .

The use of non-tamperable fuses is now scheduled to become mandatory on November 1, 1941. And the matter of interchangeability is left in the air. Meanwhile, the Code avoids the error of trying to legislate against competition between products holding valid patents. This is sensible. Nature will take its course.

We once had many types of lamp bulbs, and attachment plugs. But in the end, to serve the convenience of the public and to avoid the waste in production, stocks and distribution of these excess and duplicating varieties, we came down to a single standard. So it will be with the "Type S (safety) Fuse" as we are now asked to call it.

We need it. We want it. Something like 100 cities already require it. We should not wait until all competitive types are reconciled to unity. Let's start using it and inter-changeability will follow.

Keep Your Shop Salable

Motor shop men who keep their equipment modern have a great advantage. They can invite their customers into their shops. But a shoddy shop doesn't dare do it.

Modern manufacturers who use automatic machine tools realize today how good equipment cuts costs. They don't want to do business with motor shops that are behind the times. Why should they?

It pays to be up to date—to look modern. Then you can convince factory management that you can handle their breakdown work efficiently. And then you can sell yourself.

Opinion on the Code

Opinion is strong among electrical men that present practice in our Code making needs revision. Many letters commenting on our September opening editorial and F. C. Hodkinson's article in December say so. They discuss the situation at length and the nubbin of this opinion appears on the opposite page. More will follow. Two things impress us in this interesting correspondence.

First, there is widespread loyalty to the National Electrical Code. It may be ponderous. Yet all laws lag behind public opinion. But this is our only protection against fads and fancies, and electrical men want their own Code. They do not want it to break down and fall into the hands of the U. S. Department of Labor, For that's where it would go if the government should take it over.

Second, there is general agreement that the public interest and the installing group should have more voting strength as a defense against the present very understandable commercial interest that causes the power companies, the electrical manufacturers and the stock fire insurance representatives to vote together. But the feeling is that this can be easily accomplished by the two more votes that the U. S. Conference of Mayors has asked for and the five more votes for which NECA has applied.

The NEC is a good code. It moves forward slowly—as it should. Let's keep it safe and sure and unselfish.

New Thought Will Do It

In considering the vast market for the rewiring of houses in America, one fact stands out. Here we have a new kind of electrical business—many millions of small wiring jobs that must be done at a low price. And the profit will come through new methods, a new management plan.

Harris Dexter, power company sales manager in Poughkeepsie, is flirting with the same idea in another form. He is now collecting 3,000,000 nickels a year from small consumers. He has worked up a complete electric kitchen outfit, priced at $122.00, that sells for 10 cents a day—all plug in devices—refrigerator, roaster, grill and water kettle. Farm bred young men sell 'em to farmers' wives.

We better be thinking about this re-wiring of houses in the same free-minded way. What new tools, materials and methods are needed?

Any Tool Casualties?

Inspector George Welman of New Orleans continues to raise the question—When are we going to quit killing people with portable lamps and equipment? He is thinking particularly of saws and other tools.

Mechanics ignore the need for proper grounding and get caught. But the responsibility is in large part up to electrical men. We've got to find a way to make these things safe to use.

What experience have you had? What do you think is the cure for this trouble? What should be done about it?

To Rate House Wiring

At the North Central Wiring Conference, Charles V. D. Dunn of Kansas City suggested a system for rating and grading residential wiring. Classifying each home under two ratings, the system provides a measure of copper capacity and accessibility.

Applied to residential wiring standards in different cities, such a rating scheme would permit immediate comparison without the necessity of cross checking specifications. The system deserves standardization and nation-wide application to the adequate wiring program.

On Telling The World

Old P. T. Barnum opened an era. He told the world and the press, in particular, that he didn't care what

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they said about him providing they mentioned his name. And he was a genius in getting his name mentioned. The electrical contractor on the other hand seems to have a genius for anonymity.

Yet, the very stuff and substance of the electrical contracting industry is loaded with dramatic human interest anecdotes that would warm the heart of any city editor.

That emergency lighting job that permits the surgeon to carry on in the event of power failure. That installation of fluorescent tubes in the downtown office building washrooms that allows the girls to put on their make-up under daylight conditions for their noon-day stroll. That sterilamp installation which guards the customers of a prominent restaurant from disease germs. These are things that electrical contractors do. They are packed with human interest and they are news.

When you do a job like this, take a couple of pictures showing your men installing the equipment. If they should be wearing a company uniform with your name across it so much the better. Then, write a letter to your local newspaper and tell them the story. It is good for your business.

Back Talk

Votes on the Code Committee

To the Editor—"Mr. Hodkinson's article on 'The Electrical Committee' is in error in listing the International Municipal Signal Association and the City of New York as each having one voting representative.

"As an observer during the recent session of the Committee, you perhaps noted various occasions when the views of the membership were 'scrambled' quite differently from Mr. Hodkinson's forecast. Perhaps you also noted a unanimous vote for each of the several articles of the Code, as amended by the discussions of the meeting. To my mind, this last fact makes the subject of voting strength of itself properly classified with cryptograms, cross word puzzles and other gymnastics, a form of entertainment without substance of practical use."

A. R. Small, Chairman
Electrical Committee, NFPA

To the Editor—"I have just read the article by F. C. Hodkinson. Mr. Hodkinson has included one representative from the International Municipal Signal Association and one from the City of New York. They discontinued both of these memberships at the time they added the five representatives of the U. S. Conference of Mayors.

"I cannot agree with him that the manufacturers and the utilities hold the balance of power over the rest of the Electrical Committee. If you add the votes controlled by the insurance interest, and the governmental, inspection and installation groups, you will find that it totals 30 votes. Since it requires only 17 votes to block any proposal for change in the National Electrical Code, there is ample power to prevent any action being taken that would be contrary to the interests of the public."

Frank Thornton, Jr.
Westinghouse Elec. & Mfg. Co.
East Pittsburgh, Pa.

Mr. Hodkinson listed the Municipal Signal Association and the City of New York because the removal of these two members, we understand, has not yet been approved by the American Standards Association, which sponsors the NFPA Electrical Committee and gives its Code the status of a national standard. The Signal Association has appealed, we are told, and been promised a hearing. The City of New York is content to be dropped, we understand, because its representative now sits with the Conference of Mayors group. Meanwhile, the Mayors Conference has asked for two more votes. The National Electrical Contractors Association has applied for five more votes. We hope they get 'em, for the present voting bloc includes the power companies, and both the manufacturers and insurance companies from whom they buy.

The Electrical Committee Issue

To the Editor—"The editorial 'Sic Semper' has struck me as worthy of answer. On the Electrical Committee but three members represent the specification and customer group out of the total 51 voting. Where is the person to speak for our old friend John Q Public, who, after all, pays all the bills?

"The writer attended the Asheville Convention and listened to long, windy arguments about whether to use this or that. Very few knew, apparently, or cared, whether there was one best, cheapest way. Please let's do something before the public get disgusted with the whole business.

"The one, vital safety device has never been stressed. Install untamperable protection of proper capacity and all other things will take care of themselves with a minimum or regulation."

J. H. Ross
Port Sulphur, La.

To the Editor—"I am glad to see someone else waking up to the unbalance in the membership of the Electrical Committee. More than two years ago the International Association of Electrical Inspectors passed a resolution calling for a greater representation of the public interest.

"This year the U. S. Conference of Mayors was recognized, but the public interest is still less than one-third of the committee. This is about the same as the insurance interest and less than the combined representation of the utility and manufacturing group.

"The Electrical Committee needs a thorough reorganization. I question also whether any interest should be given multiple representation, if its representatives are to be instructed to lump their votes and not be able to express different views when these views arise from their own immediate contacts with wiring practices."

Morton G. Lloyd, Chief
Section of Safety Codes
National Bureau of Standards
Washington, D. C.

To the Editor—"Just a line to congratulate you on the splendid discussion of 'The Electrical Committee' by Frank C. Hodkinson. Such an analysis coming from a man with such a background, is worth serious study. Certainly code making should be a matter of safety engineering.

"Your editorial in the same issue pointed out much more effective ways of promoting the electrical industry than chiseling safety out of the National Electrical Code.

Wm. J. Wheeler, President
The Maintenance Company, Inc.
New York

To the Editor—"The article by Frank C. Hodkinson is probably the most challenging appraisal of the Electrical Committee presented since this Committee has been operating.

At the recent Electrical Committee Meeting anyone could observe that the voting of the commercial groups was a directed vote on all important matters. The vote of one commercial group waited upon and joined with the vote of some other commercial group at numerous important junctures. The various groups are very conscious of the voting strength, and are practiced in forming coalitions.

"Your tabular classification to show 'Balance of Power' in the Committee personnel is much sounder and fairer than that proposed by the Scopes Committee of the American Standards Association."

William J. Canada
New York

Many letters have come in commenting on our discussion of the present balance of power in the Electrical Committee. These are just a few. More will be published. Most of them agree that the public interest and the electrical contractors should have more votes. And it looks as though this may come about.

Those Tips From Socrates

To the Editor—"I enjoyed reading your editorial 'A Tip From Socrates', and would like to inquire what kind of liquor you drank the night before. It must have been exceptionally good for this article was certainly right on the nose. I hope it will cause some people to think."

Earl N. Peak, President
Marshall Elec. Co., Inc.
Marshalltown, Iowa

To the Editor—"Your editorial 'A Tip From Socrates' is interesting. However, there are a number of problems that enter into such a method of furnishing electric service.

"It is a characteristic of the American people to have what they want when they want it. And with peak limiting devices, I am afraid it would be difficult to satisfactorily serve the American home and give them what they want. I may be wrong, but this is one of the problems I think of in using such a scheme. The suggestion is worthy of study, and I hope someone makes such a study in the near future."

Chas. V. Dunn
Kansas City Power & Light Company

To the Editor—"Your interesting 'Tip From Socrates' is quite a mouthful. Like 'Old Soc——' himself, our company is concerned about the 57 (or 157) varieties of power company service equipment.

"Incidentally, some improvement is being made by the gradual elimination of many varieties of meter service switches. More standard devices are being used for service equipment than ever before. This, at least, is a step in the right direction."

Robert C. Graves, Director of Sales
The Trumbull Elec. Mfg. Co.
Plainville, Conn.

To the Editor—"Why in the world did you throw out such questions without thought as to what controversies they could start, or discussion as to the facts, thus avoiding inaccuracies? Questions are all right about anything, but broadcasting them without full discussion usually increases controversy. I thought we had enough controversy already."

Ralph D. Cutler, Vice President
The Hartford Elec. Light Co.

To the Editor—"What a wow of a guy old Socrates was, and what a 'soc' he carried. Congratulations, this is one of the best you have done."

T. H. Bibber
Triangle Conduit & Cable Co., Inc.
Elmhurst, N. Y.

To the Editor—"I congratulate you on the far-reaching editorials that you have been writing in Electrical Contracting this past year, especially the one in December. You are certainly awakening the entire electrical industry. You will eventually force it into a position of devising a militant plant of cooperation, conceived and executed in terms of the welfare of the whole industry.

"I was interested in 'Old Soc's' remarks . . . while you are finding out how to sell Adequate Wiring to old homes'. I don't believe the consuming public is interested in the electrical man's prosperity. But I do believe the public is interested in what the electrical industry has to sell them—in terms of better living."

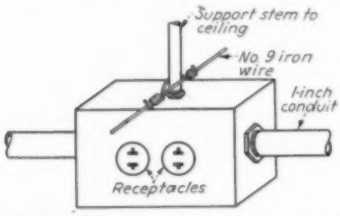
R. D. Horning, Secretary-Manager
Seattle Adequate Wiring Bureau

Some people have not liked the frank suggestions of our "Socrates" editorial. One good friend protested against our editorials generally because he thinks they are "provocative." Well, these ideas were thrown out hoping to stimulate recognition of the urgency of the rewiring problem that now has the electrical industry bogged down. Somebody must find the answer. Somebody must act. We are eager to help "provoke" any thought we can in this direction.

WIRING Methods

RIGID SUSPENSION

A group of evenly spaced, suspended power plug receptacles over an assembly line bench required reasonably rigid suspension at minimum cost. A simple system was devised by the Sterling Electrical Co., electrical contractors of Omaha, Nebr. Each box was hung on a ½-in. conduit stem firmly attached to the ceiling. The conduit



THREE-WAY anchoring for suspended receptacle boxes uses support stem, feeder conduit, and tie wire.

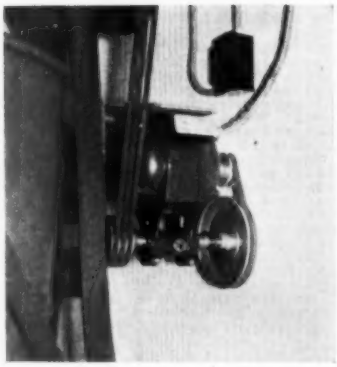
feeding each row of boxes lengthwise was firmly anchored at either end of the line.

To prevent swinging the whole line, iron tie wires were stretched across the row of receptacles, anchored at both ends of the room and firmly tied to the supporting stem.

JACK-SHAFT MOTOR

In converting several machines to individual motor drive in a Chicago food plant, the Oppenheimer Electric Co. provided some with a special motor and jack-shaft combination to allow standard motor speed on odd speed drives.

As shown in the illustration, the motor is mounted under a steel plate attached to the machine. The end bells of the motor are special castings including a jack-shaft support. The jack-shaft is equipped with an eccentric bearing which permits belt adjustment. V-belts and pulleys transmit power from the motor shaft to the jack-shaft



JACK-SHAFT and V-belt drive used to adapt individual motor drives to odd speed demands.

and from the jack-shaft to the driven pulley on the machine.

PIANO WIRE FOR UNDERFLOOR DUCTS

The Beach Electric Company, electrical contractors, Newark, N. J., uses piano wire to aid in leveling underfloor ducts, because of its high tensile strength and non-sagging qualities.

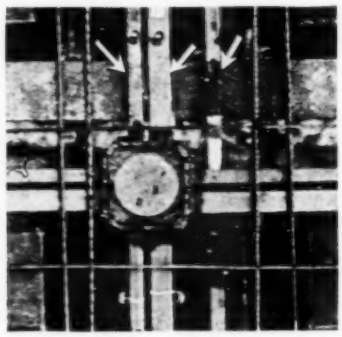
In the application shown, the junction boxes were set in plaster of paris at the correct elevation. The wire, strung between the boxes, was secured by means of angle iron brackets fastened to the tops of the boxes. A small turn buckle at one end permitted the wire to be made taut. The interconnecting duct was lined up and leveled with the wire as a guide. Because the wire was tight and had no sag, accurate leveling was possible.

WITH PIANO WIRE as a guide, accurate leveling of underfloor ducts is possible. This wire does not stretch or sag.

SPOT WELDS HOLD FLOOR DUCT RIGID

The Norton Electric Co., electrical contractors, Ithaca, N. Y., recently employed spot welding in an installation of underfloor duct. This method was used to aid in holding the duct in place when the concrete was poured.

At each point where it crossed a steel beam, the duct was spot welded to that



SPOT WELDING of underfloor ducts to steel beams gives added rigidity to duct system and keeps it from "floating."

beam. The reinforcing rods were laid over the duct system.

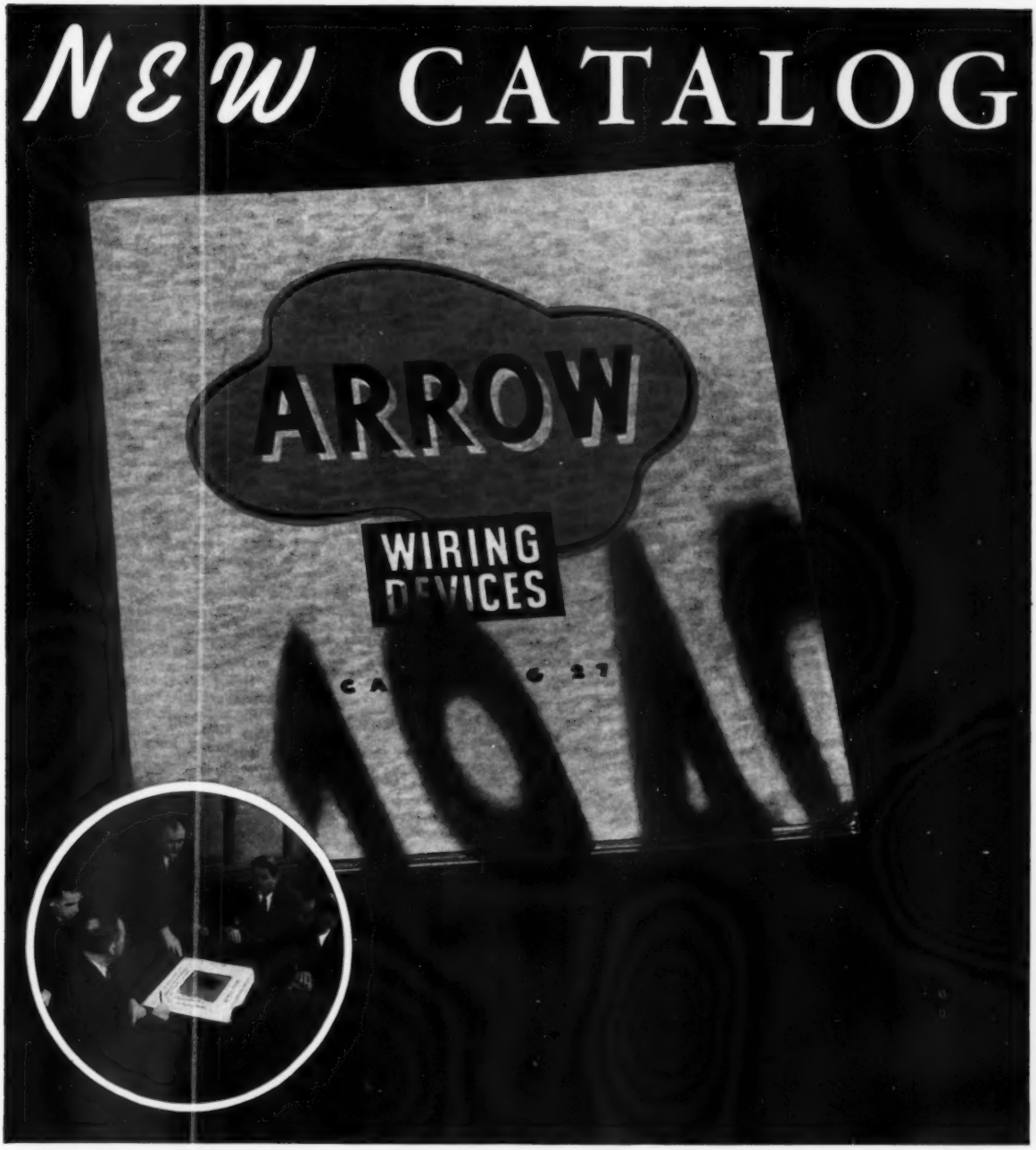
In this particular case, the floor construction was of the "pan" type. The welded joints together with the intermediate supports fastened directly to the pans, prevented the duct from "floating". Much of the time, ordinarily wasted in watching and realigning ducts during the pouring operations, was thus saved.

CONDUIT AND BOX SUPPORTS FOR NARROW PARTITIONS

During the construction of a large housing project in Elizabeth, N. J., the Joseph J. Tomasulo Co., electrical contractors, faced the problem of mounting outlet boxes in 2-inch partitions and running concealed conduits to them.

With the special permission of the local inspection authorities, they used smaller than the normal radius for the 90 degree bends. The outlets were held rigid in the partitions by a special support made of ⅜-inch bolt rod. A two hole mounting plate was welded to the

NEW CATALOG



2684 Wiring Device items fill this book with unprecedented interest for the Contractor. It takes 88 pages to show you the line; it's taken 50 years to *develop* the line to its present completeness for ADEQUATE Wiring.

Many *new* devices are here catalogued for the first time, besides hundreds of highly reliable numbers in Flush Switches and Sockets —all types; Plugs and Receptacles for 10 Amp. to 50 Amp. circuits—polarized—2 to 4-wire. Complete Plate Line for all flush jobs:—Bakelite, Ivorylite, metal in all finishes . . . See them all in the one big book that brings your reference data *up-to-date!*

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To ARROW ELECTRIC DIVISION, The Arrow-Hart & Hegeman Electric Co., Hartford, Conn.

SEND ME free and promptly your new Catalog 27.

(*Name*) .....

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(*Street & No.*) .....

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SOLD THROUGH YOUR **ARROW ELECTRIC DIVISION** ELECTRICAL WHOLESALER

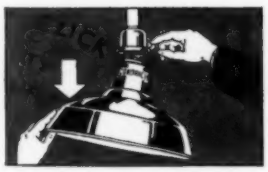
THE ARROW-HART & HEGEMAN ELECTRIC CO. HARTFORD, CONN.

NOTHING EASIER

To Install or Service

LIGHTS WHEN IT'S LOCKED

You simply wire and attach the hood to install this lighting fixture. Reflector and lamp is snapped on later. To remove for cleaning, release the snap lock; reflector and lamp comes off as a unit—instantly. To attach, press the reflector into the hood—it locks automatically and lights when it's locked.

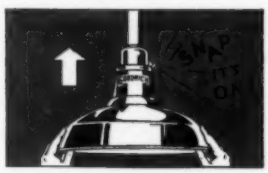


Release snap lock to remove reflector and lamp

DISKONECT REFLECTORS

There's nothing to corrode or stick in the metal-to-glass connection between hood and reflector. Socket is instantly removable for thorough cleaning of reflector. The Diskonect is an exclusive Goodrich product.

Sold only through electrical wholesalers



When it snaps into place, it's locked

MEMBER OF R. L. M. STANDARDS INSTITUTE

GOODRICH
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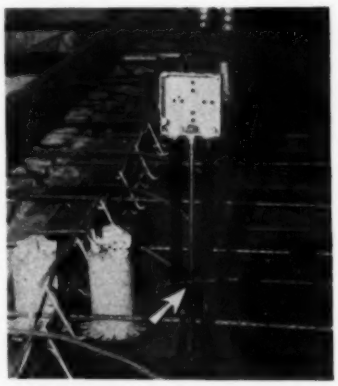
WIRING Methods

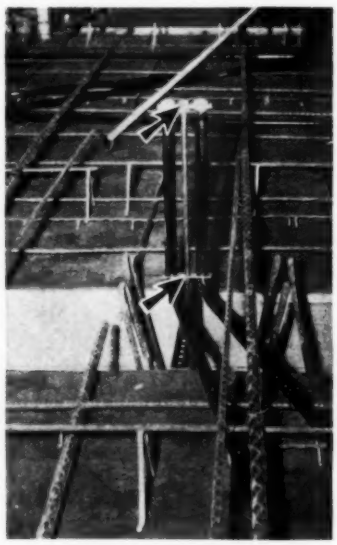
[FROM PAGE 24]

bottom of the bolt. The top of the rod was threaded for two nuts. Two flat iron spacers were used to hold the conduit rigid.

These spacers have a bolt hole in the center and one hole on each side to take ½, ¾, or 1-inch conduit. One was wedged at the bottom and the other held at the top by the two nuts, to give a rigid support to the conduits and keep



***RIGID BOLT ROD** support for outlets in narrow partitions. Arrow points to conduit spacer.*



***SUPPORT FOR CONDUIT** where outlet boxes are not used. Arrows point to spacers.*

them in place during the pouring operations. Where outlet boxes were used the top spacer was unnecessary as the box served the same purpose.

Where outlets were located in a partition centered over a concrete beam, the form was bridged with a piece of heavy perforated band iron and the support was bolted to it.

U.S. Laytex

*REG. U. S. PAT. OFF

More Than Equivalent To Code Wire!

Electrical Testing Laboratories Report* says:

"**1.** These latex-insulated branch-circuit wires, with fibrous covering, and with 0.018-inch insulation wall, in sizes Nos. 10, 12 and 14 Awg, are more than equivalent in insulation resistance, dielectric strength (volts-per-mil), durability of the insulation, current-carrying capacity, and facility of installation in rigid conduit, to similar sizes of standard rubber-covered wire made to conform to the requirements of the 1937 Edition of the National Electrical Code for Type R wire, "for voltages not exceeding 600 volts," and should therefore be entirely suitable for installation in accordance with the wiring methods set forth in Chapter 3 of the Code.

"**2.** Since these latex-insulated wires show considerably smaller depreciation in tensile strength and elasticity than the limits set for performance-type compound, the wire should retain satisfactorily its physical and electrical properties under conditions of continuous operation at a maximum copper temperature of 60° C.

"**3.** The maximum percentages of the cross-sectional area of conduit shown in Table 5, Chapter 9, of the 1937 National Electrical Code for Combination of Conductors are applicable in determining the number of conductors of latex-insulated branch-circuit wires that can be installed in rigid conduit."

*REPORT NO. 150223

Electrical Committee Agrees...
See Your Electrical Trade Papers!

UNITED STATES RUBBER COMPANY

1790 Broadway, New York, N. Y.

MANUFACTURERS OF ELECTRICAL WIRES, CABLES, TAPES AND LINEMEN'S BLANKETS

Better Lighting

LIGHTING A BUS STATION

The Bus Terminal of the Atchison, Topeka and Santa Fe at San Francisco, is probably one of the best lighted stations of its kind in the country. The waiting room, 45½′ x 78′, has ten ceiling

LIGHT AND COLOR—A deep blue ceiling and cream walls and plenty of light to read by in this Bus Terminal in San Francisco. Mazda lamps are used with Holophane units.

fixtures, each with eight 200-watt lamps in Holophane units spaced on 16′ x 22′ centers and mounted 23′ high. The ticket office occupies 2180 square feet and is lighted with the same type of equipment, nine units equipped with three 200-watt lamps. The illumination averages 30 footcandles.

By using direct type equipment, the interior decorator was able to use deep colors. The waiting room ceiling is dark blue and the ticket office ceiling is vivid red. The walls of both are cream.

COST OF PRODUCING LIGHT

One buys lamps to produce light economically. Otherwise lamps might be designed to last a lifetime. For a lamp can be made to last one hour or a million hours with equal ease.

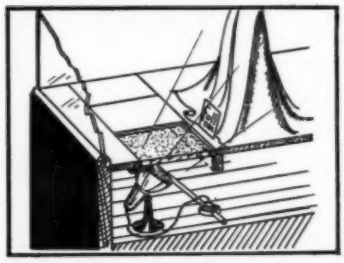
In cost-of-light calculations it is convenient to use a million lumen-hours as the quantity of light. This is roughly equivalent to the total quantity of light produced by a 100-watt lamp during its normal life when operated at normal voltage (1,047,500 lumen-hours). The formula for the *unit cost of light* is given in the following convenient form:

$$\text{Cost per Million Lumen-Hours (Dollars)} = \frac{10}{\text{Efficiency}} \left(\frac{\text{Lamp Cost}}{\text{Watts} \times \text{Life*}} \right.$$

$$\text{Kwhr. Cost)} \text{ or } = \frac{10}{E} \left(\frac{P}{WL} \right. R).$$

In this formula, the values are referred to as follows:

- E = Average lumens per watt throughout life
- W = Average watts consumed throughout life
- *L = Average lamp life, in thousands of hours
- P = Net cost of lamp delivered in socket, in cents
- R = Cost of electrical energy in cents per kilowatt-hour.



***REMOVABLE FLOOR**—By constructing the show window floor with removable sections like "traps" in a theatre stage, any of these sections can be lifted out and a spotlight unit or the projector spot can be placed below to brilliantly light a part of the display at close range. A square of stippled glass or a section of metal louvers can be set in the opening to conceal the reflector. By using panels of opal glass, a luminous floor can be formed and lighted in color.*

GROUP REPLACEMENT OF LAMPS

Lamp cost, in many installations, involves cost and inconvenience of replacement. This is important where a large number of lamps are burned the same number of hours per day at uniform socket voltage or where groups of lamps require special facilities for relamping, as in street lighting, large store and office buildings, signs, coves and other hard-to-reach places.

In these instances, lighting service can be improved and the actual cost of producing light might be decreased by replacing all the lamps in a group at some fraction of the average life. If the costs of replacing individual lamps

***OUTDOOR SALES ROOM**—This outdoor used car display was made as attractive as the regular indoor new car sales room, by planning even, glareless illumination with an intensity of approximately 8 to 10 footcandles. The Hatfield Electric Co. installed 16 floodlights of 1000-watt size on ten 30-foot poles. There are also two poles at the center of lot, each with two high-bay aluminum reflectors, for reducing the possibility of shadows. All wiring is underground. This 100 by 200-ft. corner sales lot is operated by the Capitol Motor Co. of Indianapolis. As proof of the value of this lighting, this company's used car sales are the most satisfactory among local distributors.*

UMI

Announcing The New...

LIGHTMASTER

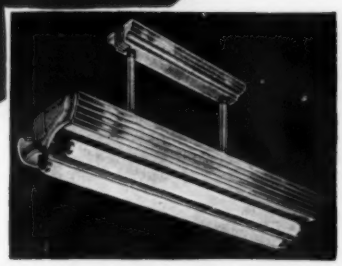
Copyright 1940 by Day-Brite Lighting, Inc.

The smooth flowing lines of the LIGHTMASTER will blend well with any decorative theme in stores, offices, hotels, restaurants, theaters and public buildings of all types.

The LIGHTMASTER provides improved quality high level illumination for all seeing tasks. It is reasonably priced and easily installed. Available for two and three lamps, 24"–20 watt and 48"–40 watt size.

Three finishes — Satin Chrome and White or Aluminum baked enamel. All units are wired, ready to install and include new type ballasts which correct power-factor and lamp flicker.

BULLETIN F-20 CONTAINS COMPLETE DETAILS ON THESE NEW UNITS—WRITE FOR YOUR COPY NOW



Also Made With Stem Hangers for Suspension

Available After March 1, 1940

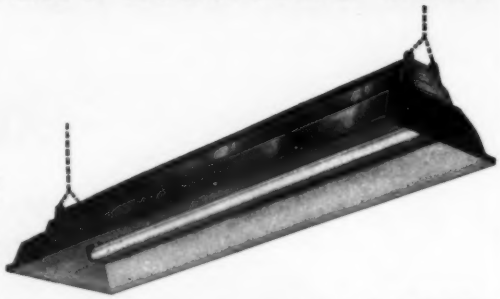
Sold Thru Your Electrical Wholesaler

Day-Brite Lighting, Inc.

5421 Bulwer Ave. St. Louis, Missouri

THE NEW WHEELER
RLM
FLUORESCENT LIGHTING UNIT

Every Wheeler RLM Fluorescent Unit bears the RLM Label which guarantees its authenticity and performance.



A TWIN LAMP UNIT (40 watts each) DESIGNED FOR GENERAL LIGHTING PURPOSES IN INDUSTRIAL AND COMMERCIAL AREAS

The Wheeler RLM Fluorescent Lighting Unit is designed and manufactured to conform with specifications established by the RLM Standards Institute for a type of Fluorescent Unit which will provide uniform general illumination and color correction in Industrial and Commercial areas.

The unit is recommended for use with the "Daylight" Fluorescent Lamp and can be used in any location where efficient daylight quality illumination is required. It provides color-corrected light, is extremely efficient, cooler in operation, ideal for color matching, easily installed, and easily serviced. The unit, which employs two 40-watt, 48" Fluorescent Lamps, can be supplied with Ballasts for 110–125 volt, 199–216 volt, or 220–250 volt operation. It is furnished complete with lamp sockets and starter switch sockets mounted in the ends of the unit in such a manner as to provide the desired lamp shielding angle of 17½ degrees below the horizontal.

Tulamp ballast equipment, with removable and renewable separate starter switches located in the sockets, and a compensator which facilitates starting and insures satisfactory lamp performance, complete the unit.

FEATURES

78% Light Output:

The reflector design, position and spacing of lamps, and high reflection factor of the porcelain enamel reflecting surfaces, combine to produce this high fixture efficiency.

72½ Degree Angle of Cut-Off:

Lamps are positioned so that when a point from the center of a lamp is connected with a straight line to the lower edge on the opposite side of the reflector, this line will form an angle of 72½ degrees from the vertical.

Wattage Consumption:

The total wattage consumption of these two lamp fixtures, including lamp ballast equipment, runs between 94 and 98 watts, depending upon the circuit voltage.

Mounting and Spacing:

Intended primarily for low bay mounting, this unit will provide maximum efficiency at mounting heights up to 12' above the floor.

The spacing between units should be approximately the same as the mounting height of the unit above the floor.

Finish:

Reflectors are porcelain enameled, gray outside, white inside.

Methods of Suspension:

Unit can be supplied for chain or pipe suspension.

For complete data write for New Bulletin No. 63

Distributed Exclusively Through Electrical Wholesalers

WHEELER REFLECTOR COMPANY

275 CONGRESS ST., BOSTON, MASS.

NEW YORK ATLANTA CLEVELAND

Better Lighting

[FROM PAGE 28]

as they fail are relatively high, the group-replacement plan is preferable. At 90 per cent life, 72 per cent of the lamps are still burning, at 80 per cent life 84 per cent remain. Replacement at 70 per cent average life is often-times adopted as the economical point for group replacement, for at this point less than 10 per cent of the lamps should have failed normally. The most economical schedule will depend on conditions and requirements for each specific installation.

NOVEL FLUORESCENT WINDOW LIGHTING

While making some interior changes, the Werdenberg Clothing Co., Elmira, N. Y., decided to utilize a blank wall space facing one of the main thoroughfares. They installed two show windows behind the wall cases. The windows are 4 feet high, 5 feet wide, 20 inches deep and are accessible from the store interior through hinged doors. The interior of each case is finished in gumwood with a dull varnish.

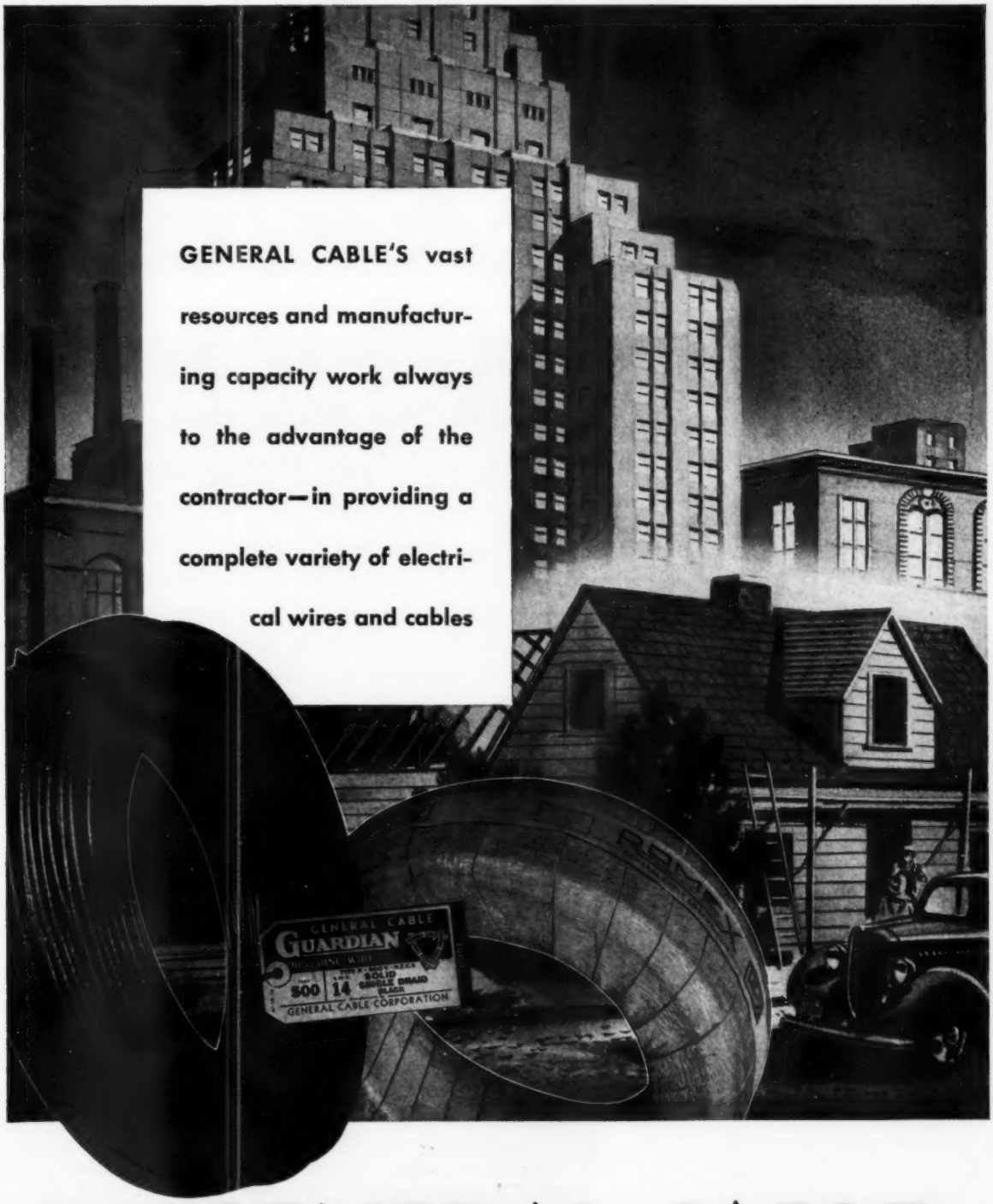
***CONCEALED LIGHT** — Fluorescent troughs blend with metal window frame at Werdenberg Clothing Co., Elmira, N. Y.*

Each show window is flooded with light by four 36 in. and two 18 in. daylight fluorescent lamps. The fixtures have a satin nickel silver finish with a background to match other metal work. The reflector has a white enamel finish. The units, mounted to border the glass, give a wide angle of distribution with good light on the merchandise still concealing the light source from the customer's vision.

The reactors are located in a cabinet under the window. One extra convenience outlet is provided in each window for special display purposes.

Stempfle Electric Co. of Elmira, N. Y., designed, manufactured and installed the fixtures.

UMI



GENERAL CABLE

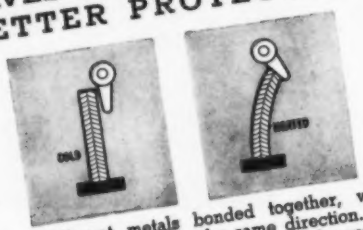
BARE and INSULATED WIRES and CABLES for EVERY ELECTRICAL PURPOSE

General Cable Corporation Sales Offices: ATLANTA • BOSTON • BUFFALO • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DETROIT KANSAS CITY (MO.) • LOS ANGELES • NEW YORK • PHILADELPHIA • PITTSBURGH • ROME (N.Y.) • ST. LOUIS • SAN FRANCISCO • SEATTLE • WASHINGTON (D.C.)

Get Bi-Metal ... and Eliminate

SEE HOW
HEAT BENDS BI-METAL

HERE'S HOW BI-METAL SAVES MONEY... GIVES BETTER PROTECTION



Two different metals bonded together, when heated always bend in the same direction. The heat from short circuit or continued overload currents causes the Bi-Metal, which is exactly calibrated to the job at the factory, to act and open the circuit. Because of Bi-Metal's characteristics, its accuracy never changes, regardless of the number of operations. There's nothing to replace . . . nothing to wear out.

Ask Your Westinghouse Representative For This Bi-Metal Demonstration

Make This Test Yourself. . . . A strip of Bi-Metal and a match are all you need to prove to yourself the time and money-saving advantages of Bi-Metal Protection. Ask your Westinghouse Representative for a Bi-Metal Demonstration Kit.

YOU PAY NO MORE FOR BI-METAL PROTECTION ON THIS WESTINGHOUSE EQUIPMENT

LIGHTING AND POWER PANELBOARDS
Bi-Metal protects circuits and eliminates fuses. "De-ion" arc quenchers save costly parts. Tamper-proof.

THERMOGUARD MOTOR
Single-phase sizes up through 3 hp. Impossible to burn out. Bi-Metal gives positive protection at all times.

"DE-ION" MOTOR WATCHMAN
Manual motor starter for motors up to 7½ hp. Bi-Metal overload protection. "De-ion" arc quenchers. On-Off. Tripped-out indicating.

Westinghouse

W
WESTINGHOUSE ELECTRIC

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Protection
Fuse Replacements

NOTHING TO RENEW OR REPLACE WITH *NOFUZE* CIRCUIT BREAKERS

Bi-Metal has changed all ideas about circuit protection. It's no longer necessary to spend time and money for fuse replacements. Westinghouse Nofuze Breakers eliminate fuses and give positive, accurate protection.

Bi-Metal opens the circuit instantly when a dangerous overload or short circuit occurs. To restore the circuit, just move the operating lever to "RESET" and then to "ON" position. There's nothing to renew or replace.

You save outage time . . . save maintenance time . . . save replacement costs. Give your men and machines the safe, accurate protection of Bi-Metal. You get these savings at a cost that is often less than a complete switch and fuses. Specify Westinghouse Nofuze Breakers on your next installation.

NOFUZE CIRCUIT BREAKER—"ON," "OFF" and "TRIPPED" positions clearly visible. Safety interlock prevents cabinet door from being opened when in "ON" position.

"DE-ION" ARC QUENCHERS AT NO EXTRA COST

Westinghouse "De-ion" arc quenchers confine, divide and extinguish the arc instantly . . . preventing burning and prolonging the life of contacts.

Westinghouse Electric & Mfg. Co.
East Pittsburgh, Pa.

J-90339

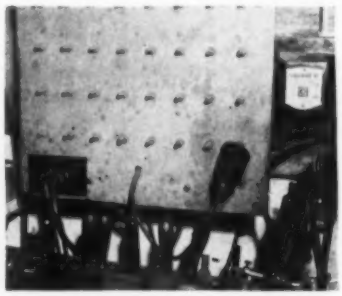
Motors and Control

UMI

Motor Shops

VARIABLE VOLTAGE TEST BOARD

A variable voltage test board, with 32 voltage taps in five volt steps from 110 volts to 260 volts, is one of the integral parts of the workbench in the shop of Walter J. Rider at Binghamton, N. Y. The 32 studs protruding through the fibre board are fed from 32 taps off the secondary of a 5 kva., 110 volt double wound transformer. The insulated clip



THIRTY-TWO VOLTAGE taps in five volt steps from 110 to 260 volts are on this motor shop test board. Soldering iron and welder circuits are connected through current transformers.

can be attached to any tap on the board.

The motor to be tested or any appliance or soldering iron is plugged into the receptacle on the board. By using a choke coil ½-volt steps can be secured. Three 40-ampere current transformers connected in reverse of the conventional manner are used in the circuit for the soldering iron or welding apparatus. Various voltages for different conditions are obtained at the board. Mr. Rider says this is an invaluable piece of equipment in his shop.

TIME-SAVING TOOLS FOR CLEANING STATOR SLOTS

The French Gerleman Electric Company of St. Louis, uses motor driven grinding wheels and brushes to remove bad copper welds or burrs and stubborn lumps of insulation from the slots of stripped stators. This equipment takes the place of odd gadgets such as chisels, files or saws formerly used to gouge, poke or file the slots. The time spent on this phase of cleaning has been reduced to a fraction of the former time, and workmen are saved a lot of arm power and skinned knuckles. The likelihood of sharp points remaining unnoticed in the slots to puncture new cell insulation is eliminated.

The grinding device sold by Potter and Rayfield consists of a small motor with flexible shaft and chuck, mounted on a wheeled cabinet. Some special grinding rods were made by the Carborundum Company. These rods were made ¼-inches and ⅜-inches in diameter, the abrasive material being built on a ⅛-inch steel rod which extends 1-inch beyond the abrasive on each end. The rods are held by the chuck on one end and by a metal grip on the other end, and are inserted in the stator slots. Driven at a speed of 1750 r.p.m. through the flexible shaft, they are easily handled and controlled by the winder and do a very satisfactory job of grinding away the copper welds in less than one-fourth of the time formerly required.

MOTORIZED CLEANING — Tough cleanup spots in stripped stators made easy by power grinder and brush wheels.

Some small grinding wheels were also assembled on a 1/16-inch diameter spindle. This spindle is small enough to slide up and down the opening of a semi-enclosed stator slot, and when driven by a small high speed grinder, quickly removes small welds and blisters not reached by the grinding rods.

The flexible shaft and chuck also serves another purpose. Digging out pieces of old slot insulation often requires more time than the balance of the stripping. The Pilley Flue Brush Company of St. Louis made some ¼-inch by 7/16-inch D special wire brushes which when driven through the flexible shaft quickly cut out these stubborn pieces of slot insulation. As only one end of this brush is held in position there is a whipping action to the brush. The brush is inserted in the slot before rotating. If the stator slots are in a vertical position, the old insulation drops out at the bottom, as the brushes are of the screw type. With the slots in a horizontal position, the material remains in the slots but can easily be removed with air.

While this device was designed for occasional tough jobs, the wire brushes are now used on most stator jobs. The company pays 80 cents each, in dozen lots, for the wire brushes and has cleaned from eight to a dozen stators with a single brush. Assuming a cost of 10 cents per stator, against a saving of one to three hours time, it presents a worthwhile saving. This equipment is made by Potter and Rayfield, Inc., of Atlanta.

CABINET FOR HIGH PRESSURE CLEANING

A totally enclosed cabinet for spatterless cleaning of motor parts with solvents under high pressure was built by the Boustead Electric & Mfg. Co. of Minneapolis. This outfit cuts cleaning time considerably, does a more thorough job and affects economy in solvent, because higher nozzle pressure makes a small amount of liquid go a long way.

In addition to the cabinet and tank, the principal elements of this outfit comprise a 250 g.p.h. pump, ¾-in. and ½-in. piping, and a ¼-in. swivel nozzle connected to the ½-in. pump outlet with oil-proof hose. The cleaning nozzle has a ball and socket joint where it passes through the cleaning tank so it can be swung in any direction. With a glass door panel in the cabinet door and a 100-watt reflector projecting light through a glass panel in the top, the parts are visible during the cleaning operation.

YOUNGSTOWN "BUCKEYE CONDUIT" IS LIKE AN EXTRA HELPER ON THE JOB

Made from a steel developed for this work alone, the conduit has a ductility which is uniform throughout each length. Work with a hickey is fast and quick. Your workmen can make real time when the conduit bends on comparable radii with the same flexibility and there's no back lash in the pipe. Threads, cut once, are clean, need no chasing.

Buckeye Conduit is lined with satin-smooth lacquer lining, flexible but tough. Fish wires won't scratch through, and when you push cable on short runs, there will be no cracked lining to fight.

Speed on a job means profit, and Youngstown Buckeye Conduit is the first step to making time and saving money on any installation.

BUCKEYE TRADE MARK YOUNGSTOWN CONDUIT

THE YOUNGSTOWN SHEET AND TUBE COMPANY
Manufacturers of Carbon and Alloy Steels
General Offices - - - YOUNGSTOWN, OHIO

Ask your distributor for Youngstown Conduit - Pipe and Tubular Products - Sheets - Plates - Tin Plate - Bars - Rods - Wire - Nails - Tie Plates and Spikes. 28-10B

YOUNGSTOWN

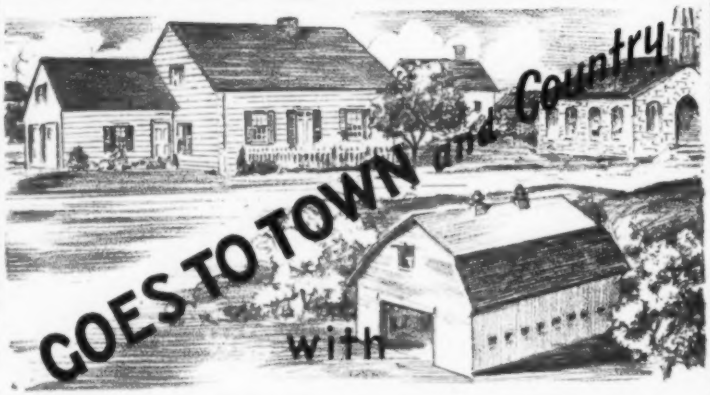
UMI

RUBBER COVERED POWER CABLES • BUILDING WIRE

CRESCENT

VARNISHED CAMBRIC • FLEXIBLE CORDS • LEAD ENCASED AND PARKWAY CABLES • ARMORED CABLE

CRESFLEX NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • MAGNET WIRE • BARE WIRE



CRESFLEX

NON-METALLIC SHEATHED CABLE

ADEQUATE WIRING SERVES AND SAVES

Step up your business volume and promote adequate wiring in farm communities as well as metropolitan areas—in homes, farm buildings and commercial properties. CRESFLEX gives an all-insulated wiring system that is the most suitable where a low resistance water pipe ground is not available. Its low cost, ease and speed of installation make it the MOST POPULAR R.E.A. WIRING MATERIAL.

CRESCENT INSULATED WIRE & CABLE CO. INC
TRENTON, NEW JERSEY

Atlanta Baltimore Boston Buffalo Chicago Cincinnati Cleveland
Detroit Indianapolis Kansas City Los Angeles Minneapolis
New Orleans New York Philadelphia Pittsburgh St. Louis San Francisco

CRESCENT ENDURITE SUPER • AGING INSULATION

Motor Shops

[FROM PAGE 34]

The principal dimensions of this cabinet are:

Total Height.....54 inches
Width .....24 inches
Depth .....24 inches
Height of motor and pump platform ..... 6 inches
Height of bottom of main tank .....20½ inches
Height of cleaning plate....28½ inches
Height of swivel nozzle.....33 inches
Net door opening—14¼ inches by 18¼ inches.
Glass door panel—11¾ by 18¾ inches.
Sloping front at angle of 54 degrees starting 10 inches from back of cabinet.
No. 14 gauge steel used throughout.

This cabinet has been in use slightly over a year and is considered one of the best time savers this company has ever installed.

JIFFY SOLDERING SET

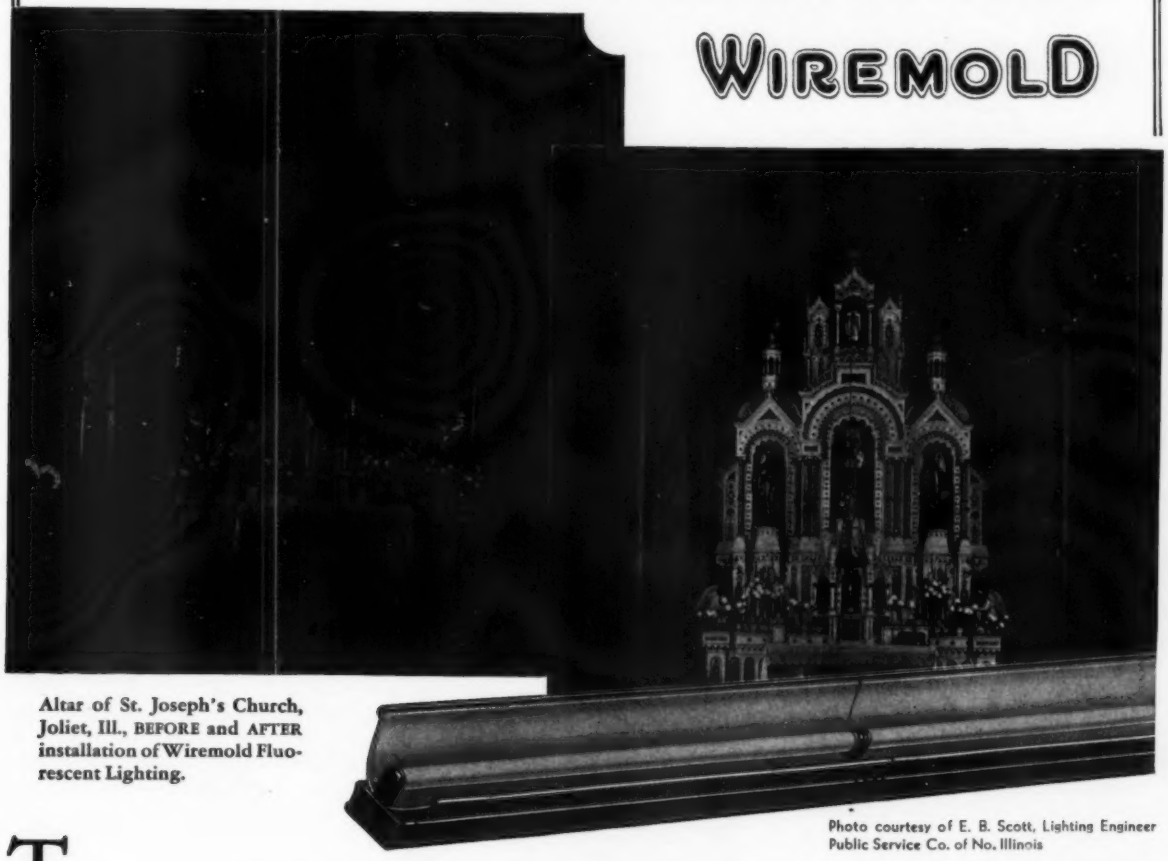
L. F. Rossier, Electric Motor Repair and Engineering Co., Binghamton, N. Y., uses a jiffy soldering set, which he constructed for small motor work only. The set consists of a 15,000-volt sign transformer and a soldering tong made of spring copper with carbon tips. The soldering tong is clamped to the low side and 110 volts are fed into the high side of the transformer. The current range for soldering is from 0 to 8 amperes depending upon the size of the joint. It is used only on wire sizes from No. 19 to No. 10. On small motors it takes only a few seconds to solder a connection. The time ordinarily required to heat an iron is saved by the use of this set, which is much easier to handle.

***EFFICIENT SOLDERING** set for small motor work. This electric set uses small current and takes only a few seconds to do the job.*

FLUORESCENT "COMES EASY"

TO CONTRACTORS WHO KNOW THEIR

WIREMOLD



Altar of St. Joseph's Church, Joliet, Ill., BEFORE and AFTER installation of Wiremold Fluorescent Lighting.

Photo courtesy of E. B. Scott, Lighting Engineer Public Service Co. of No. Illinois

THE worthwhile opportunities for contractors in Fluorescent Lighting are to be found in the execution of COMPLETE well-planned installations. Wiremold works WITH YOU in providing simple, flexible, correctly engineered equipment to which you ADD your OWN skill and labor in completing a job of which you and your customer can be proud.

Use Wiremold FLEUR-O-LIER Certified Fluorescent Lighting Equipment for CONTINUOUS STRIP or MULTIPLE STRIP Lighting, SINGLE and MULTIPLE units, SHOW CASE and WALL CASE, COVE and special installations. Wiremold Products are also listed by the Underwriters Laboratories.

Your Business Builder

ADEQUATE WIRING SERVES AND SAVES

THE WIREMOLD COMPANY, HARTFORD, CONNECTICUT

WIREMOLD

LIGHTING and WIRING EQUIPMENT

LISTED BY UNDERWRITERS' LABORATORIES, INC.

Estimating

A USED CAR LOT

A Yonkers, N. Y., automobile agency recently equipped its used car parking lot with floodlights and electric signs. The electrical contractor on the job kept accurate labor records for future reference.

The work included the installation of a 100 ampere, 110/220 volt, single phase, 3-wire service located in the office in the center of the lot; also, the wiring and connection of 4-1000 watt spotlights, 2-500 watt floodlights and fluorescent-neon signs with a 35 ampere load. The spot and floodlights were mounted on the 6 inch by 6 inch sign supports set by the sign contractor. Open overhead wiring was run from the office to these poles. Wiring to the lighting units and signs was installed in conduit.

The labor breakdown for the entire installation was as follows:

SERVICE EQUIPMENT—installation and connection of a 100 ampere, single phase, 110/220 volt, 3-wire service and meter equipment.
Total time ..... 9.0 m. h.

SWITCHING EQUIPMENT—installation and connection of switching equipment to control the signs and spotlights.
Total time ..... 6.0 m. h.

OVERHEAD WIRING—installation of 800 feet of No. 12 wire on bracket insulators.
Total time ..... 6.0 m. h.

CONDUIT WORK—installation of 260 feet of ½ inch and ¾ inch conduit to the signs and spotlights.
Total time ..... 5.0 m. h.

MOUNTING UNITS—mounting on the sign supports, adjusting and focusing the six lighting units.
Total time ..... 3.0 m. h.

CONNECTING UNITS—pulling wire in the conduits and connecting the signs and six lighting units.
Total time ..... 7.0 m. h.

TOTAL TIME for the entire installation 36.0 m. h.

Data from Lawrence Electric Co., Yonkers, N. Y.

TESTING LABOR UNITS

Applying labor units fresh out of a new estimating manual to a prospective job is risky business. The best of estimating manuals are necessarily based upon broad averages, the work of many contractors in many cities.

Fortunately, good estimating manual data is usually consistent. If one set of data on one operation accurately fits an individual contractor's experience the rest of the data in all probability, will be equally accurate. With this in mind it becomes a relatively simple matter for the individual contractor to set up an accurate set of labor units for himself by using any good (i.e. internally consistent) set of labor units as a guide.

Take out several finished job envelopes from the file. Using the material list or duplicate invoices, enter all materials on pricing sheets in the same way as you would figure a job. Apply the labor unit from the manual to be tested to the job. Refer to the job plan or to your previous estimate for unusual conditions or extra labor items that would not be reflected in the material. Totalling the labor estimated, add on the customary items for lost time, superintendence, etc. that you would use in figuring the job.

The estimated figure thus obtained may then be compared directly with the actual cost of labor on the job. If units are in dollars and cents the total cost of labor may be used. If the units are in labor hours they may be compared with the actual labor hours on the job. Either way will provide an equally accurate ratio.

Dividing the actual time by the estimated time provides an "experience factor", which may be expressed as a decimal or percentage.

For example—estimated time 100 hr., actual time 94 hr., which dividing 94 by 100 would give .94 or 94 per cent as the "experience factor".

If the labor units in the manual are internally consistent, it follows that if the actual to estimated ratio is true for a whole job it is probably also true for any unit or group of units. By applying the "experience factor" to each of the labor units the contractor may work up his own set of labor unit tables. Or, the more common practice, he may apply the factor to the total labor or estimate on any job priced with units from the manual.

The following table is an example of the technique applied to a school job. The pricing sheets were made up from material lists in the job folder.

LABOR UNIT CHECK RECAPITULATION

	Estimated Labor Hours
1—Branch circuit	1070.87
2—Feeders & panelboards	377.49
3—Telephone wiring	161.07
4—Radio, Fire Alarm and Clocks	307.86
5—Fixtures	100.75
6—Special equipment	18.00
Misc. Labor	33.96
Non-Productive	190.00
Total man hours	2260.00
Actual labor hours from time cards	2140.00

$\frac{2140}{2260}$ = .947 or 95% experience factor

***GRAIN ELEVATOR** work requires an experienced organization and extraordinary precaution against fire, says J. G. Hupp of the Electric Motor Co., Cedar Rapids, Iowa.*

Specializing in all kinds of industrial and power work since 1911 the Electric Motor Co. has installed the majority of electric wiring work in grain elevators throughout the state of Iowa.

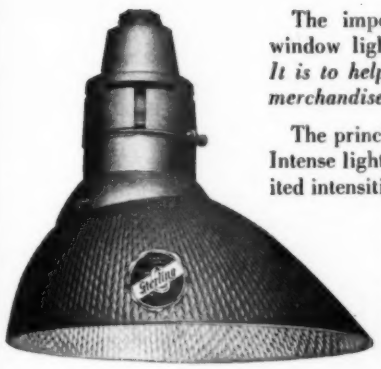
LAYOUT DETAIL

In laying out work on the blueprints ready for estimating, the estimator frequently finds it necessary to make extensive calculations. Cross references between plans and sections, and other time-consuming work that are lost when the plans are cleaned up and returned. Later, if the bid is successful, the same work has to be done all over again.

To preserve these details of layout,

Effective
Show Window Lighting
Demands
Efficient
LIGHT CONTROL

DIAGRAM A— DIAGRAM B—



The important function of show window lighting is well established. *It is to help display and glorify the merchandise.*

The principles involved are simple. Intense light on the display, with limited intensities at upper levels, *centers interest on the merchandise.* Attention attracted by the *light source* or by light *other* than on the display *defeats this purpose.* Thus a brilliantly lighted window *without proper concentration on the merchandise* may be a "*dud*" when it comes to creating buying interest.

The efficient light control *which is so essential to show window lighting* has been *built into* **Sterling** Reflectors through *years* of *specialized development.*

The **Sterling** Lite-Flo Stipple and other design features *direct light to the merchandise display* with greatest efficiency. Light on unimportant areas that *detracts* from the merchandise and *wastes* electrical energy is *minimized.*

Your merchant customers *will appreciate your pointing out these many reasons why* **Sterling** Reflectors *light their windows as they should be lighted.*

Catalog and complete information on request.

It's light *on the merchandise that* makes cash registers *ring* for merchants! Intense lighting of the upper window is not only *wasteful—it actually detracts.* The diagrams above illustrate this point.

Use of greater intensity with the *inefficient projection* shown in Diagram A actually *makes* the merchandise *less visible.* It's different with the efficient projection shown in Diagram B. Here *greatest intensity is on the merchandise* to *bring* out color, fabric, design and workmanship—*attract attention to the* MERCHANDISE *and create buying interest.*

That's *WHY* **Sterling** Silvered Glass Reflectors *offer show window lighting effectiveness unapproached* by any other type of illumination. They are *designed* to project light *to the merchandise* with *minimum waste* and *highest efficiency* for every shape and size of window.

To help you give your merchant customers the *full* benefit of **Sterling** Reflector efficiency, *show window layouts will be furnished on request.*

Sterling Silvered GLASS Reflectors

STERLING REFLECTOR CO., 1435 West Hubbard Street, CHICAGO

UMI

For Better Work and More Profits

Put GREENLEE Timesaving Tools on the Next Job

By using Greenlee Timesaving Tools for bending conduit, enlarging knockouts, pulling cable, pushing pipe, and other operations, much can be accomplished in the way of efficiency and much can be done to insure more profits. But that isn't all. In most cases it means that better work will be done on each job.

We know all these things to be true because so many users of Greenlee Tools have told us so. In fact many have told us that certain of these tools have more than paid for themselves on the very first job.

Hydraulic Conduit Benders

Greenlee Conduit and Pipe Benders are timesavers from the word go. Not only do they do the job in a hurry, but they make a smooth, even bend, and they save the cost of many manufactured fittings.

The rigid conduit bender, shown above, is made in two sizes for conduit from 1¼ to 3-inch and from 3 to 4½-inch. The smaller bender can also be fitted with a set of attachments for bending 1¼, 1½ and 2-inch thin-wall steel conduit.

Cable Puller

This new tool has won the approval of all who have seen it in action. It clamps right to the conduit through which cable is to be pulled. Can be used in any position, is readily portable and has two operating speeds.

Do You Have a Copy of Catalog No. 31-E?

This catalog illustrates and describes the Greenlee line of tools for electrical work, including all those listed in the coupon below. If you have a copy it will pay you to study these tools carefully. If not, ask for one now. You will find that it points the way to better work and more profits on every job.

GREENLEE TOOL CO. **Rockford, Illinois**

Use this Coupon and Save Time

GREENLEE TOOL CO., ROCKFORD, ILL.
Please send information on the following tools:

☐ Conduit Benders ☐ Cable Puller ☐ Knockout Tools ☐ Radio Chassis Punches
☐ Joist Borer ☐ Electricians' Bits ☐ Bit Extensions ☐ Pipe Pushers
☐ Send Copy of Catalog 31E

Name ..... Address .....

City ..... State .....

My Jobber is ..... E.C. 2-40

Estimating

[FROM PAGE 38]

keep a pad of letter size, inexpensive tracing paper at hand. These pads of tracing paper in various sizes may be obtained from stationers or drafting room supply houses. Tack a sheet over the critical area of the blueprint and trace in room outlines free-hand, noting the room numbers on the tracing. Then draw in the layout details as accurately as necessary.

If the contract is secured, the detail drawings can be lined up on the construction plan by means of the room outline and the details transferred by carbon paper to the construction plan.

CHICAGO WIRING PRICES

As a brake on unbridled price competition in residential wiring in the Chicago area, the Cook County Electrical Contractors Association appointed a committee to study the cost of residential work. They wanted to determine a reasonable minimum price based on local conditions.

After a careful analysis of cost, the committee found that the following minimum charges on outlets provide a nominal profit for the contractor based on prevailing costs of material and labor—

Receptacle	$3.82
Switch	3.82
Ceiling	3.66
Bracket	3.66
Bell with chimes	10.00
Service outlet including ground 1" — 2#6 & 1#8	18.50
Service outlet including ground ¾" — 2#8	15.00
FLAT BUILDING: (use above schedule)	
Additional meters ..... each	9.20
Additional bells ..... each	5.00
Speaking tube per apartment	3.82
Mail box per apartment	6.50
OLD WORK:	
1 outlet	6.00
2 outlets	10.00
3 or more outlets ..... each	4.25

The information was distributed generally to electrical contractors in the area, regardless of membership in the association, for their information. Neither members nor non-members were obligated or urged to use the prices on their own jobs, but the suggestion is implied that contractors bidding materially below these figures should make a careful study of their estimating methods.

Maintenance

SELECTING THE CORRECT DRIVE

ALL too frequently, the plant electrician considers the subject of drives to be in the realm of the mechanical man. This may be true.

But the electrical maintenance man should also have a working knowledge of these all-important links between the motor and driven machine. He should be familiar with the various types of drives available; the particular features and application of each; how to select the proper type; when and if to change from the present to a new method; whether to use direct connection, chain, V-belt or speed reducing drives.

Often, by changing the present set-up, the efficiency of both the motor and the driven machine may be increased, noise and vibration reduced, floor space conserved and maintenance costs lowered. So power transmission drive problems often arise in every plant. And the maintenance man should be qualified to make suggestions and help solve them.

With this in view, the Maintenance Guide Sheets this month present a general discussion of the selection, application and maintenance of couplings, gears and chains. Previous articles covered:

1. Alternating Current Motors
2. Direct Current Motors
3. Alternating Current Motors—Maintenance
4. Direct Current Motors—Maintenance
5. A.C. Motor Starters and Controllers
6. D.C. Motor Starters and Controllers
7. Maintenance of Control Equipment
8. Special Control Problems
9. Electric Distribution
10. Lighting
11. Electric Heat
12. Electric Welding
13. Interplant Communication
14. Instruments
15. Power Tools
16. Batteries and Rectifiers
17. Electroplating
18. Electronic Devices
19. Circuit Breakers
20. Equipment for Hazardous Locations
21. Transformers
22. Wiring Devices and Fittings
23. Wire and Cable
24. Bolts and Pulleys
25. Couplings, Gears and Chains (this issue)

Coming articles will discuss

26. Elevators, and Industrial Trucks
27. Conveyors, Cranes and Hoists
28. Ventilating and Air Conditioning Equipment
29. Management of Maintenance

DRIVES . . . Part Two

COUPLINGS, GEARS and CHAINS

Types and Applications

OFTEN it is put up to the electrical maintenance men to provide a definite speed on a motor drive with mechanical power transmission equipment. Either coupling, gears or chains are usually selected, depending on the proximity of the driven shaft. As a basis of selection, this quick review is presented on these "positive" drives. It covers various types, their use and some important points on upkeep.

Couplings

The two general types of couplings—rigid and flexible—are designed for transmitting power equivalent to the maximum size of shaft which they may couple.

Couplings are rated in horsepower at 100 r.p.m., and are listed in sizes according to shaft diameter or maximum bore in inches and maximum r.p.m. In the selection of a coupling for a motor or a line shaft (1) decide on the type (rigid or flexible) to be used, (2) determine the capacity (hp. at 100 r.p.m.), and (3) select the size according to the maximum bore.

A table in the Maintenance Guide Chart lists horsepower at 100 r.p.m. for line shafts of various diameters. The following formula may be used as a guide to calculate the horsepower of a shaft:

$$HP = (D^3 \times N) \div 80$$

where HP is the horsepower of the shaft, D is the shaft diameter in inches, and N is the shaft speed in r.p.m. Either of these methods will aid in determining the capacity of couplings. In the wide variety of couplings available for selection, the following should be considered—

1. *Rigid couplings* are used for connecting rigidly two shafts that are properly aligned. Three general types of rigid couplings are: plate or flange, compression, clamp and sleeve.

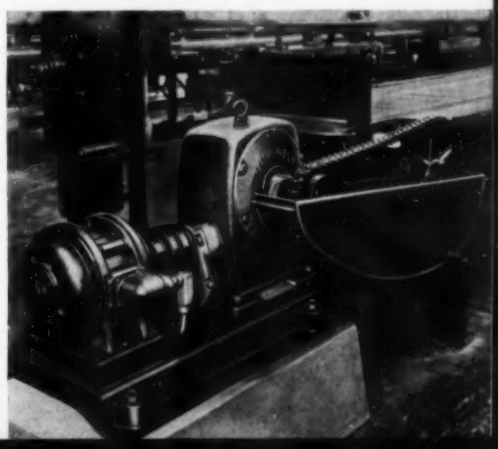
a. *Flange or plate couplings* are made in two halves, reamed for a force fit and fitted with taper keys. When connecting shafts of the same diameter and to insure alignment, the couplings should be installed with one shaft extending about ½ in. into the bore of the opposite half coupling.

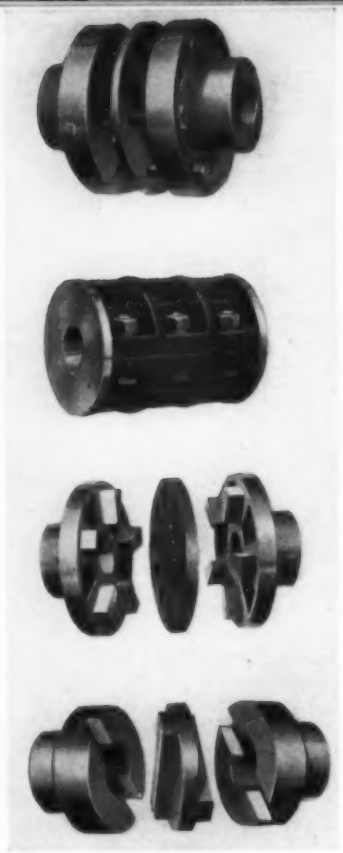
b. *Reducing flange couplings*, for connecting shafts of different diameters, should be the size equivalent to the larger shaft, and made with a male and female fit outside the bolts near the rim of the flanges.

c. *Ring compression couplings* are especially suited for outdoor use.

d. *Threaded cone compression coup-*

FOR A POSITIVE DRIVE—Power is transmitted by a coupling, gears, speed reducer and chain from a high-speed motor to a slow-speed conveyor.





TYPICAL COUPLINGS—(A) Flange coupling with separating plate, (B) Ribbed compression or clamp coupling, (C) Leather-disc flexible coupling, (D) Double-slide flexible coupling (Courtesy T. B. Woods Sons Co.).

lings are perfectly smooth. They are particularly adapted for textile or other mills where dust or lint may collect in recesses or on projections.

e. *Ribbed compression or clamp couplings* are made in halves and keyed to the shaft. They may be used to couple a broken shaft; also because of the clamping feature, they may be used temporarily without keys.

f. *Solid sleeve couplings* are plain sleeves set-screwed to the shaft. They are suitable for light steady loads.

2. *Flexible couplings* are used, principally for connecting motors direct to machines or extended shafts, and to compensate for misalignment that may occur after installation. However, the shafts must be aligned as closely as possible because the coupling cannot be used as a universal joint. All flexible couplings should permit slight lateral movement such as is found in motors, and have clearance between the faces.

a. *Double-slide flexible couplings* are suitable only for slow-speed applications, such as on the output end of a speed reducer where the speed is less than 100 r.p.m. This coupling requires lubrication and should have a reservoir in the center.

b. *Belt type flexible couplings* are suitable for the same speed and power as the shaft equivalent to the maximum bore that the coupling will permit. They are not suitable for drives that have back lash or a reversing tendency. Special belt type couplings, such as for jordan drives, have a lateral movement from 10 to 12 in.

c. *Leather-disc type couplings* have leather between the halves. The flexibility is the clearance between the cast iron lugs on the coupling halves and the holes in the leather.

d. *Rubber-bushed pin type couplings* permit misalignment only as the flexibility of the rubber will permit it.

Other types of flexible couplings provide for flexibility by utilizing elements having either gear teeth, laminated steel pins, or spring-like grid joining the hubs; some require lubrication.

When *selecting* couplings the factors to be considered are: (1) power to be transmitted; (2) diameter of driver and driven shafts; (3) method of fastening coupling to shaft; (4) alignment of shafts; (5) type of load—constant, varying and subject to shock; (6) frequency of starting and stopping; (7) speed limitation; (8) atmospheric conditions; and (9) lubrication.

Gears

Gears in general consist of the following types—spur, helical, herringbone, worm and worm gear combinations, spiral, miter, and bevel gears, and pinion combinations.

Spur, helical and herringbone gears are applied on parallel shafts. Worm and worm gear combinations are primarily used for maximum speed reduction, when shafts are at right angles to each other and in different planes. Miter gears and bevel gears are used principally when shafts are at right angles to each other and in the same plane.

As pinion teeth, as a rule, are individually weaker and engage more often than do teeth of the larger or companion gear, it is good practice to use a stronger material for the pinion than for the gear. Pinion of steel and gear of cast iron is the most common practice for ordinary industrial applications. Rapid wear of the pinion teeth is often successfully overcome by case hardening. For heavy-duty gearing, and particularly when shock loads are encountered, cast steel gears with pinions of alloy steel, heat-treated before machining give good results.

Self-supporting *non-metallic* gears made of materials such as Formica, Micarta and Textolite are popular to combat noise. Fabroil pinions are capable of standing up well under heavy loads and are used on many heavy-duty applications. They are composed of compressed cotton held between steel shrouds or endplates. The face of the Fabroil pinions should be sufficiently wide so that the shrouds do not contact the teeth of the mating gear.

Spur gears have straight teeth across the face of the gear and pinion and are probably the most common type used in industrial plants.

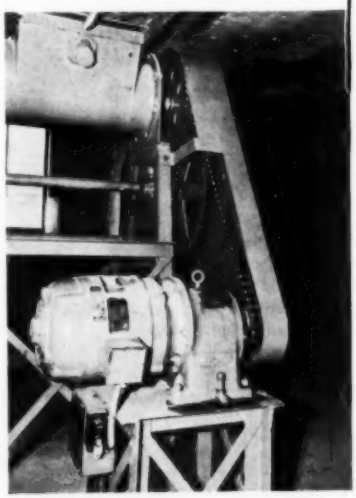
Helical gears which are simply spur gears with teeth cut on an angle are often used on applications requiring a greater degree of smoothness and quiet running. They are, however, more difficult to replace, and develop end thrust.

Herrigbone gears are, in appearance, like two helical gears of right and left hand cut, fastened together. They are used principally on heavy-duty applications when speeds are extremely high. End thrust is neutralized, but otherwise they have the same general advantages and disadvantages of single helical gears.

In a *worm gear* combination, the worm may be of the single or multiple thread type. Single-thread gearing is the least efficient but provides the greatest reduction. Provision must be made for end thrust for both the worm and worm gear. The direction of thrust is determined by the direction of rotation.

For slow-speed applications, a soft steel worm and cast iron gear is most common. High-speed applications usually require a case hardened steel worm with threads ground and polished, and phosphor bronze gear. Worm gearing is essentially a friction drive, hence lubrication is more important on this type than on other types of gearing.

Spiral gears serve much the same purpose as worm and gear, but are limited to low ratios. In appearance they resemble single helical gears except that the helic angle of the teeth is greater.



***COMPACT DRIVE** consists of a motor and a speed reducer built as an integral unit (Fairbanks, Morse & Co. photo).*

MAINTENANCE GUIDE CHART

HELPFUL DATA ON SELECTION OF COUPLINGS, GEARS AND CHAINS

LINE SHAFTS, HORSEPOWER AT 100 R.P.M. (Horsepower varies directly as the speed)

Shaft Diam., in.	15/16	1 3/16	1 7/16	1 11/16	1 15/16	2 3/16	2 7/16	2 11/16	2 15/16	3 7/16	3 15/16	4 7/16	4 15/16	5 7/16	5 15/16	6 7/16	6 15/16	7 7/16	7 15/16
Hp. at 100 r.p.m.	1	2.4	4.3	6.5	10	14	20	26.5	34	54	80	114	156	208	207	340	420	500	640

MOTOR AND SHAFT COUPLINGS—(Various Types with Sizes of Shafts)

RIGID COUPLINGS		FLEXIBLE COUPLINGS
Flange or Plate Shafts 1 3/16 to 9 15/16 in.	Keyless Compression Shafts 15/16 to 3 15/16 in.	Double-Slide (Oldham) Shafts 1 to 6 in.
Flange with Separating Plate Shafts — same as above	Ribbed (Clamp) Compression Shafts 1 3/16 to 6 15/16 in.	Belt Type Shafts 15/16 to 5 15/16 in.
Double-cone Compression Shafts 1 15/16 to 8 15/16 in.	Ring Compression Shafts 1 15/16 to 5 15/16 in.	Leather Disc Shafts 3/4 to 5 1/2 in.
Threaded (Collins) Compression Shafts 1 7/16 to 4 15/16 in.	Solid Sleeve Shafts 15/16 to 2 7/16 in.	Rubber Bushed Pin Shafts 1 1/2 to 5 1/2 in.

GEARS AND SPEED REDUCERS

SPUR GEARS

Determine the pitch and face width by referring to gear manufacturer's table which lists horsepower and tooth load ratings for the various pitches at specified pitch line velocities.

For continuous service select gears having a 50 per cent greater rating than originally indicated. Where shock loads are encountered, select gears having a 100 per cent greater rating.

Check capacity of spur pinion by the following formula:

$$W = S\ p'\ f\ y \times \frac{600}{600 + V}$$

where W is load transmitted in pounds (force at pitch line of gear), S is static stress of material (from table), p' is circular pitch, f is face, y is a factor (0.1 for quick calculations), and V is velocity in feet per min.

Then substitute the value for W in the formula: $HP = WV \div 33{,}000$.

WORM GEARS AND SPEED REDUCERS

Select size from gear manufacturer's catalog and check with the manufacturer regarding horsepower operating speed and ratio, continuous and intermittent operation, mounting data, nature of load whether smooth or impulsive, and lubricating facilities.

AVERAGE VALUES FOR S IN POUNDS PER SQUARE INCH

MATERIAL	S
Non-metallic	6,000
Cast iron	8,000
Bronze	8,000
Steel	
0.20 C Natural	12,000
0.30 C Natural	15,000
0.40 C Natural	20,000
0.20 C Case-hardened	25,000
0.40 C Heat-treated	30,000

CHAINS

Chain Speed and Minimum Center Distances for Various Pitches

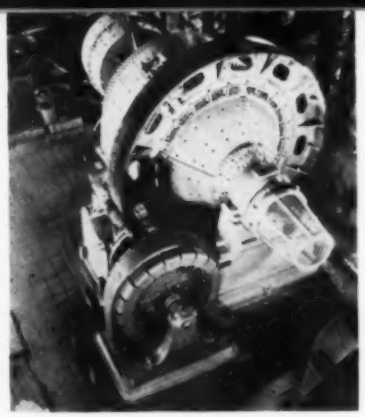
Pitch in.	3/8	1/2	5/8	3/4	1	1 1/4	1 1/2
Speed Range, r.p.m.	2000 to 4000	1500 to 2000	1200 to 1500	1000 to 1200	800 to 1000	650 to 800	500 to 650
Center Distance Min., in.	6	9	12	15	21	27	33

Service Factors for Motor Drives

Machine Load Characteristics	Service	
	10 hr. per day	24 hr. per day
Even load	1.00	1.25
Moderate Uneven load	1.30	1.65
Severe Uneven load	1.40	1.80
Shock load	1.60	2.00

TO DETERMINE THE NUMBER OF TEETH FOR THE DRIVEN SPROCKET: → Number of Teeth Driven Sprocket = Number of Teeth Driving Sprocket × R.P.M. of Driving Shaft / R.P.M. of Driven Shaft

CHECK-UP OF MAINTENANCE PRACTICE . . . SECTION 25.



***HERRINGBONE GEARS** are usually used on heavy-duty applications such as shown here—a ball mill driven by a 400-hp. synchronous motor.*

Spiral gears also are essentially a friction drive and therefore lubrication is of prime importance.

Miter gears have the same number of teeth and are equal in ratios. *Bevel gears* are of unequal ratio. Miter and bevel gears follow the same general rule as regards material as do spur and helical gears.

Speed reducers are compact assemblies of all of the foregoing types of gears, except spiral gears, enclosed in a housing with facilities for lubrication. They are obtainable in many ratios as standard items.

Motorized speed reducers and gearmotors are motors and gears built as integral units.

Good practice dictates that pitch-line velocities of industrial gearing should not exceed 1,200 ft. per min. When possible, ratios (except in worm gearing) should be limited to a maximum of 6:1. Pinions should have not less than 15 or 16 teeth, unless the speeds are comparatively slow. For requirements other than the foregoing, obtain recommendations from a responsible gear manufacturer.

Chains

Two types of chains—roller and silent—are most generally used for speed conversion and power transmission between a motor and a machine, or between two line shafts. The efficiency of a chain drive compares favorably with other types of positive drives.

Roller chains are made up of a series of highly finished hardened steel roller and pin links. The pins are made in either riveted or cotter-pin detachable types.

Silent chains or inverted tooth chains consist of high grade steel leaf links joined by either a bushing and pin, a single pin or a rocker pin.

Both types of chains run on cut-tooth sprockets, are available in multiple widths, and offer the same general advantages. The selection of either type depends primarily on the desired length of service, and whether or not extreme quietness and smoothness of operation are essential. In general, a silent chain gives somewhat greater length of service, more quiet operation, and maintains its initial efficiency for practically the entire life of the drive.

Chain drives are adaptable to short and long center distances, to varied service conditions, and are not affected by atmospheric conditions. Chains can be easily installed and removed without disturbing shafts or bearings, by removing a pin in one of the links. They may be operated at any angle. Horizontal is good practice. Vertical is to be avoided. Tight or driving strand on top is preferred.

For the proper selection and design of a chain drive, data for the following items must be available: (1) horsepower to be transmitted; (2) speed (r.p.m.) of the slow-speed shaft; (3) full load speed (r.p.m.) of the fastest running shaft; (4) diameters (in.) of driver and driven shafts; (5) center to center distance of shaft; (6) position of drive and space limitations; (7) conditions of drive—steady or fluctuating load, hours of operation, and lubrication.

Permissible chain speed depends upon the chain pitch. In general, the smaller the pitch, the greater the permissible speed. A table in the Maintenance Guide Chart gives suggested pitch selection for various speed ranges. Recommended minimum number of teeth for the driving sprocket is 15 to 17, and maximum speed ratio is 8 to 1.

Horsepower ratings for chains are given for each pitch, and per strand for roller chains, and per inch of chain width for silent chains. Most horsepower ratings are based on normal conditions of steady loads, eight hours per day operation, and good lubrication. For other conditions the chain size should be increased for satisfactory life, by applying a service factor (see Maintenance Guide Chart) to increase the horsepower before selecting a chain.

Minimum center distances for a speed ratio not more than 2½ to 1 is given in the Guide Chart. When the speed ratio is greater than 2½ to 1, the center distance should be not less than the sum of the sprocket diameters. Length of chain and exact center distances may be determined by formulas and tables in manufacturers' literature.

Maintenance

Careful and accurate installation and scheduled inspection and servicing provide for efficient operation of every drive. Here is a list of important check points:

Couplings—

1. Check alignment of driver and driven shafts and then the elements of the couplings.
2. See that all bolts, keys and set screws are tight; check operating conditions.
3. Lubricate certain types at least twice a year or more often depending on operating conditions.

Gears—

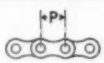
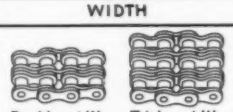
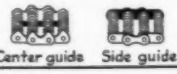
1. Check alignment of pinion and companion gear to prevent uneven wear.
2. Avoid accumulation of foreign matter between teeth.
3. Keep gear guards in place at all times.
4. Caseharden pinion if it wears excessively.
5. See that keys seat tightly.
6. Lubricate at least once a month or more often depending on operating conditions.
7. On worm gearing take up end play as gears wear.
8. If teeth break, release tight mesh; or if it is due to shock load, use a tougher steel.

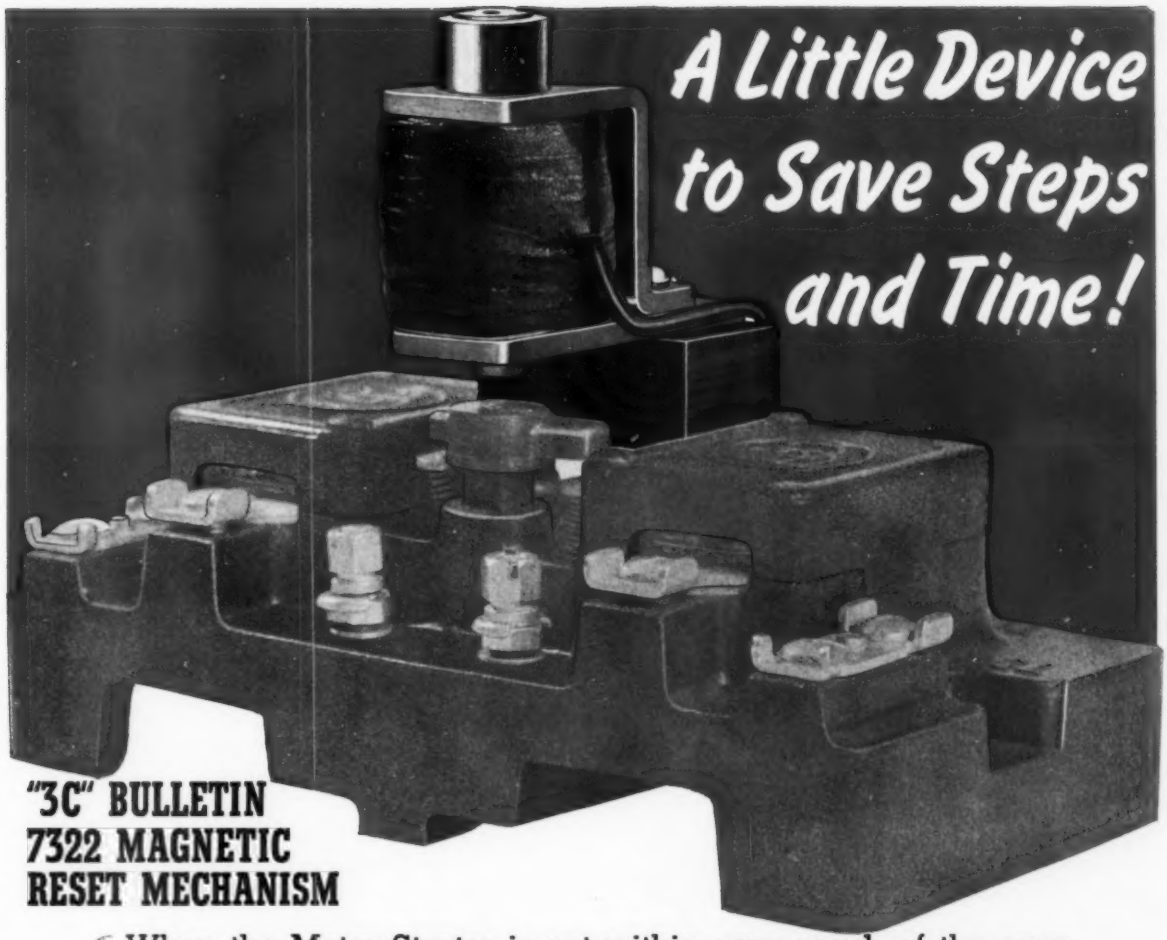
Chains—

1. See that driving and driven sprockets are aligned.
2. Keep shafts parallel and level.
3. Avoid vibration in shafting and motor.
4. See that keys are in position and all set screws are tight.
5. Keep chain well lubricated.
6. Inspect chain and sprockets as often as motor.
7. Use adjustable idler sprocket to take up slack on top strand when drive centers are fixed.

CHAIN SPECIFICATIONS

P = pitch = distance between pin centers; D = roller diameter; E = roller width; W = overall width; w = width between guides, side guide type (Courtesy Whitney Chain & Mfg. Co.)

CHAIN	PITCH	TYPE	WIDTH
Roller		Roll dimensions	
Silent		Link type or form Type of guide 	



"3C" BULLETIN 7322 MAGNETIC RESET MECHANISM

¶ When the Motor Starter is not within easy reach of the operator, and the Overload Relay trips, the operator has to walk to the Starter and press the RE-SET button before the Motor will start.

¶ This little Magnetic Reset Mechanism, when applied to Clark Starters equipped with "3C" Bulletin 7322 Thermal Overload Relays, permits the operator to reset the Overload without leaving his position.

¶ Momentary depression of a Push Button causes this Magnetic Reset Mechanism to function.

¶ It's as handy as another pair of legs, and saves plenty of time.

¶ Easy to install, too, and simple in operation. Just push a button momentarily, and this little gadget really goes to town!

¶ For your convenience, our nearest office will give you details.

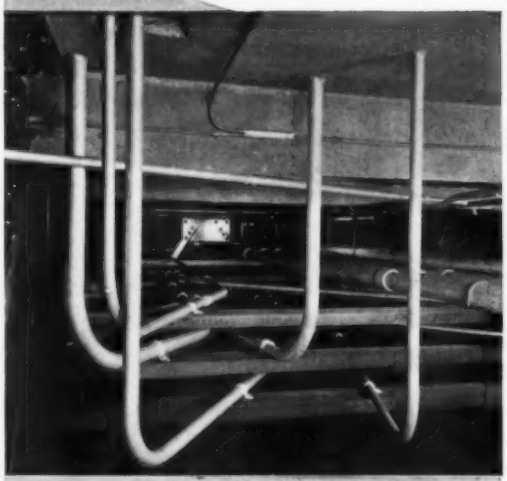
OFFICES IN PRINCIPAL CITIES

THE CLARK CONTROLLER CO.

1146 EAST 152ND ST. CLEVELAND, OHIO

This Public Utility P

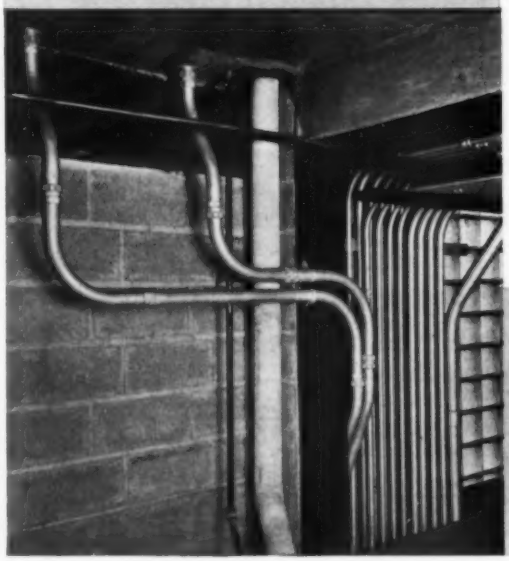
STEELTUBES IN C



ELECTRUNITE Steeltubes installed in balcony directly above the turbine room which contains two 15,000 k. w. turbines, one 12,500 k. w. turbine and one 5,000 k. w. turbine.

• • •

ELECTRUNITE Steeltubes control conduits on balcony under switch gear floor. Because there are no cut threads, Steeltubes provides an unbroken continuity of rust-resisting galvanized surface throughout the installation.



You don't have to take our word for it! Millions of feet of ELECTRUNITE Steeltubes installed in concrete prove that this original electrical metallic tubing is ideal for concrete construction — that it is safe, strong, watertight and uniformly resistant to corrosion throughout the entire system. 60,000 feet in sizes ½-inch to 2-inch, inclusive, installed in this Indianapolis Power & Light Company plant adds to that proof.

Nor need you take our word for the ease of installation of this modern threadless steel conduit. Men who have used it will tell you that it takes much of the arm-ache and back-break out of installation work.

The superintendent of electrical construction for the contractors on this utility plant, who has supervised electrical construction for 18 years, says: "It is my firm belief that Steeltubes is much easier to install. This was the first installation of Steeltubes that our crew ever put in, but they had no trouble making accurate bends and now prefer working Steeltubes to other conduit."

Learn for yourself why so many jobs are being wired in ELECTRUNITE Steeltubes. Use it for your next job—whether exposed or in concrete. It will quickly demonstrate why you should continue to use it.

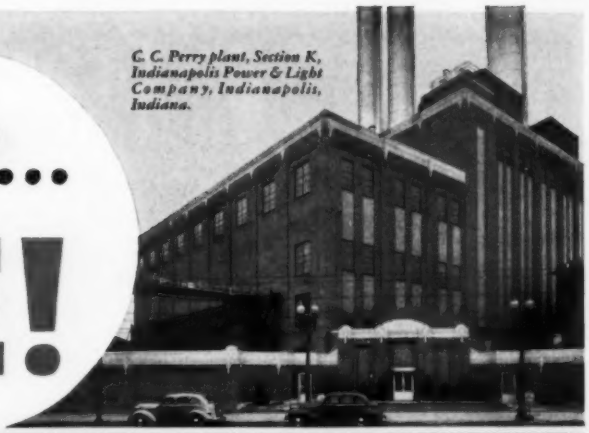
Look for this label. It is found only on genuine ELECTRUNITE Steeltubes.

UNDERWRITERS' LABORATORIES INSPECTED
ELECTRUNITE
REG. U.S. PAT. OFF.
RIGID
STEELTUBES - B
PAT. NOS. 1388434, 1435306, 1962876
N-57
ELECTRICAL METALLIC TUBING

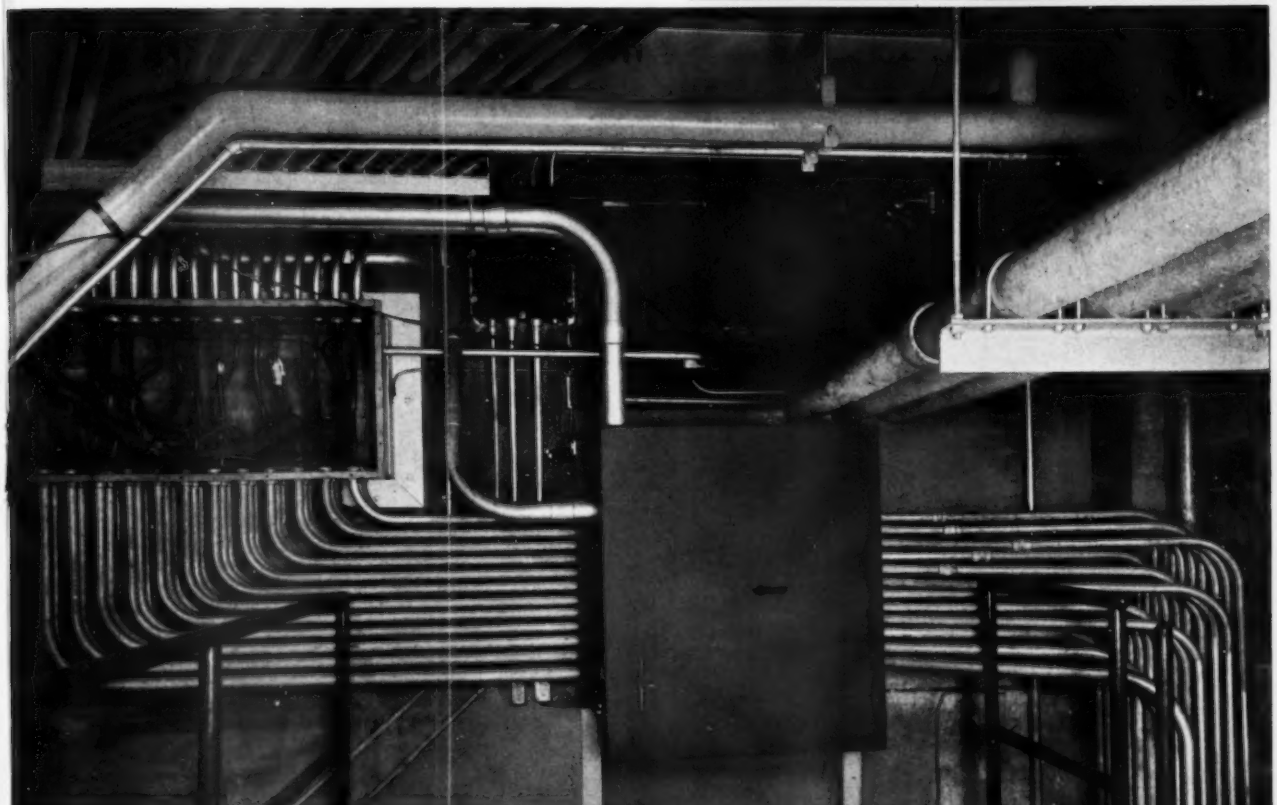
Steel and Tubes Division
REPUBLIC STEEL CORPORATION
CLEVELAND • • • • OHIO

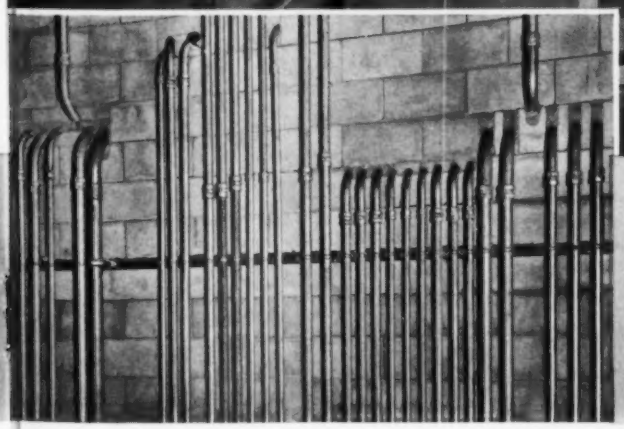
UMI

Plant uses... CONCRETE!



C. C. Perry plant, Section K, Indianapolis Power & Light Company, Indianapolis, Indiana.





Above: *Look at the neatness and uniformity of the bends in these auxiliary control conduits in turbine room basement. They run from the switch gear balcony down through turbine room basement to switch house across Kentucky Avenue. Any type of bend is easily and accurately made on the job with* ELECTRUNITE *Steeltubes.*

• • •

At left: ELECTRUNITE *Steeltubes on south wall of boiler room firing floor. Note the compression-type couplings which eliminate thread-cutting and turning the line — which make positive, watertight joints easily and quickly.*

Avoid FREQUENT REPLACEMENT

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● The life of an Electric Motor Bearing is determined by the alloy of the bronze. Such operating factors as high speeds, overloads, grit and dust must be provided for. Johnson Bearings are cast in a special high lead bronze that guarantees the maximum in performance. Try a pair on your next overhaul. There is no delay in shipping — and the bearings are fully machined, ready for immediate installation.

Free — a seventy-six page catalogue that lists, illustrates and describes the most complete bearing service available. Write for a copy—Today.

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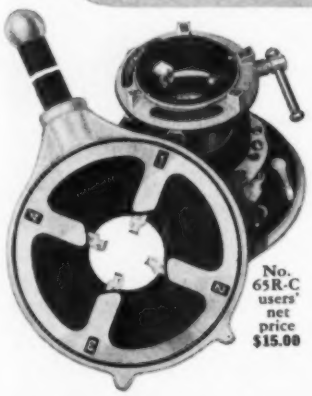
Sleeve BEARING HEADQUARTERS
490 S. MILL STREET • NEW CASTLE, PA.



THEY'RE TROUBLE-SAVERS—all the way through. Turn the gauge ring to your pipe size, put on pipe, tighten one screw—no chance for mistakes. And it threads 1", 1¼", 1½" and 2" pipe with ONE set of chasers—no extra dies to carry around, to lose. Easily shifted from one size to another.

This new all-steel malleable-alloy threader gives you speed, accuracy and perfect threads. You'll *enjoy* using it. Buy it at your Supply House.

THE RIDGE TOOL CO., ELYRIA, OHIO

RIDGID PIPE TOOLS

Electric Heat Improves Pipe Wrap

Hydraulic Supply Manufacturing Co., Seattle, wanted to obtain a more efficient bond between asbestos and other compounds in "paper" form, used for protective wrapping on sheet-steel tubing. Irregularities of hand operation were overcome by electrical heating of binder asphaltum and by installing a motor-driven winding mechanism.

Electric strip heaters were attached to a flexible spout and on the bottom of a 200-gal. asphaltum tank. They are switched on half an hour before starting operations, thus affording sufficient fluid asphaltum to begin and to continue steady production. The thermostatic control is set at 350 deg. F.

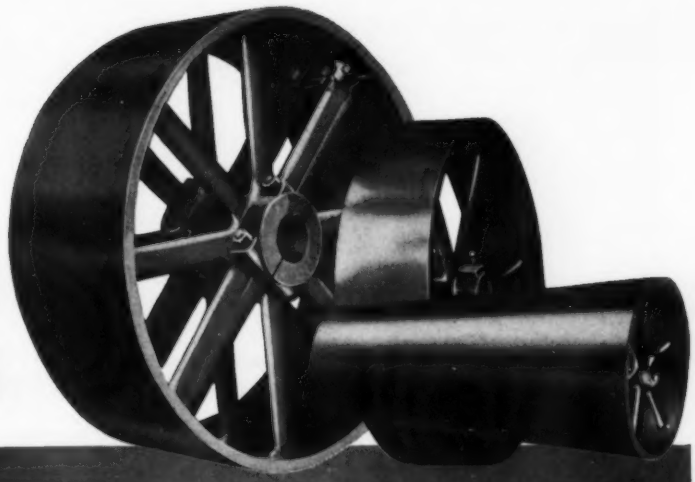
The tank is mounted on a dolly. Its movement along the 60-ft. runway of the wrapping machine is synchronized

WRAPPING MACHINE, chain driven from a motor on floor.

ELECTRIC STRIP HEATERS on bottom of tank and on spout keep asphaltum in liquid state for application to pipe wrapping material.

Wood's

CAST IRON PULLEYS



3 extra features —no extra charge!

1.
MOMENTUM IN LINESHAFT — *Ever see a lineshaft lose speed — get "jumpy" — when another machine was thrown on the line?* That can't happen where WOOD'S Pulleys are used . . . their weight absorbs the shocks, maintains a steady constant speed — because of the stored up energy due to the proper weight of the pulleys.

2.
STREAMLINE DESIGN — A Cast Iron Pulley has a calculated strength and streamlined design which not only *looks* better but in service *is* better than one which is fabricated or "built up."

The Cast Pulley will always run true — no wobbling—and will last indefinitely—no joints to loosen. WOOD'S Pulleys are good in looks, construction and performance.

3.
BETTER POWER TRANSMISSION — WOOD'S Cast Iron Pulleys have a smoothly machined pulley surface which the belt grips at every point! From more area in contact comes more input power transmitted . . . from WOOD'S higher efficiencies comes the competitive advantage of lower production cost!

"From miniature to mammoth in Power Transmission Machinery"

EVERYTHING IN TRANSMISSION

Bearings — Collars — Clutches —Couplings — Contactors — Hangers — Pillow Blocks — Pulleys — V-Belt Sheaves and Complete Drives

Add to these features the natural advantages of quality cast iron pulleys . . . greater strength . . . longer life . . . accurate balance . . . and you have a total of six good reasons for using cast iron pulleys. Write us! There's no obligation!

T. B. WOOD'S SONS CO. CHAMBERSBURG, PA.

Established 1857

T. B. WOOD'S SONS COMPANY • CHAMBERSBURG, PENNSYLVANIA

More Profit on Every Job

When You Use BM TELESCOPE SYSTEM Connectors and Couplings

THE SIMPLE METHOD!

Here's Why

- Save 25% on material
- Save 25% to 50% on time
- Quick, easy, installations
- Eliminate complications
- Stronger, neater connections
- No fussing with nuts to tighten

$1.35 Buys the One Tool Needed

This one patented tool (½" B.M. Indenter) handles 80% of all installations. Pays for itself many times over on the very first job.

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With the famous Powder-Packed Element

KLIPLOK CLAMPS
Lock fuses and clips together

KANTARK FUSES
With genuine fibre tubes (not paper)

COLORTOP PLUG FUSES
The color tells the size

FUSE PULLERS
Pull and replace fuses safely

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For motors, line shafts, solid bearings etc

UNBREAKABLE OILERS
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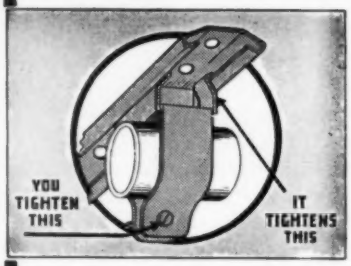
With Only One Screw to Tighten . . .

THE CLEVELAND CONDUIT HANGER



Gives You a Quicker Easier Installation

"CONVINCE YOURSELF"
"Send for Circular Giving Full Details"

THE CLEVELAND SWITCHBOARD CO.
2927 E. 79 St. Cleveland, Ohio

with the winder driven by a 2-hp. induction motor. The operator controls the winding, by a cable and reversible clutch mechanism.

Pipe, ranging from ½ to 16-in. in diameter, is first tank-dipped in hot asphaltum, then stands vertically for five minutes for cooling. Next, it rolls down a short incline and is placed on the wrapping machine. The wrapper is fed from a spool mounted at the back of the tank, then over a roller where liquid binder is distributed evenly on the inside of the strip.

The result—a product of greater uniformity and higher bond quality, at no increase in cost.

Annealing Costs Reduced

Drawn tubing for corrugated tube parts in heat control devices was purchased by Sarco Mfg. Co., Bethlehem, Pa. Because wall thickness and inside diameter of the tubes varied and grain size was irregular, rejects on inspection and test amounted to 15 per cent of each production lot.

To have full control of tube parts, an electric furnace with automatic temperature control was installed. Now bronze tubes, 1-inch in diameter, are drawn from disks in the plant. Ten drawing operations are required for a tube 18-in. long. After drawing, the

***DRAWN TUBES** from pickling bath in basement are annealed in electric furnace (right)*

tubes are sent to a pickling bath, and then annealed in the furnace to bring back the grain size of the metal to its original state.

With this improvement the company has made a 10 per cent reduction in unit costs for annealing drawn bronze tubing, with between one and two per cent in rejects of finished tube parts. In addition the furnace is used for heat treating brass castings. The furnace rated at 27 kw., is operated at 1,125 deg. F. for annealing and 750 deg. F. for heat treating.

UMI

Maintenance

"High Level"

Much loss of light can be charged to lighting equipment which is not kept clean. The reason it is not clean, in most cases, is the height at which the lighting units are mounted, such as, in some sections of industrial plants, or in commercial buildings, auditoriums, schools and theatres.

Other equipment mounted overhead often lacks attention because it is inaccessible. Inspection and servicing of fan motors on unit heaters, motors and control mounted on ceiling, sidewalls or on bridge cranes is put off until necessity requires it. Postponed inspection is a direct result of making maintenence hard to do, as when ladders and temporary scaffolds must be

INSPECTION AND SERVICING of overhead equipment will be attended to according to schedule, when a platform with telescopic action is used (Economy Engineering Co. photos).

IN LOWERED POSITION—Platform Telescoper can be moved through an ordinary doorway.

THESE MOTOR BULLETINS TELL YOU HOW TO SELECT THE RIGHT WAGNER MOTOR FOR EVERY JOB

Wagner fractional-horsepower motors are completely described and illustrated in 52-page Bulletin 177. It also contains scores of illustrations, cut-away views, cross-section drawings, speed-torque curves, etc.

Wagner integral-horsepower motors are completely described in 70-page Bulletin 182. It also includes a complete discussion of the seven electrical types of squirrel-cage motors, totally-enclosed fan-cooled motors, explosion-proof, multi-speed, slip-ring and Fynn-Weichsel motors.

Wagner single-phase and direct-current motors are fully described and illustrated in 18-page Bulletin 179. It also contains valuable information on the larger sizes of Wagner repulsion-start-induction motors, repulsion-induction and direct-current motors.

Every electrical contractor should have these Bulletins. They're FREE. Write for your copies today.

Wagner Electric Corporation
6400 Plymouth Avenue, Saint Louis, Mo., U.S.A.
MOTORS • TRANSFORMERS • FANS • BRAKES

GET *Bearings* AS EASY AS ORDERING LUNCH!

● You can get the proper Bunting Bearing for any make of motor from 1/50 hp to 100 hp instantly any time you want it. No waits. No uncertainty as to fit. The Bunting Brass & Bronze Company, Toledo, Ohio. Warehouses in All Principal Cities.

BUNTING
BRONZE BEARINGS • BEARINGS
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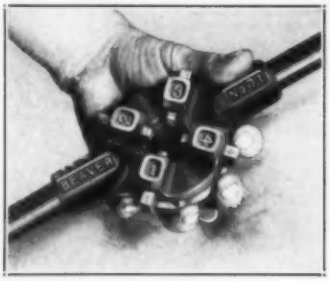
● WRITE FOR COMPLETE CATALOG WHICH MAKES ORDERING EASY.



The NEW No. 71
Pipe and Bolt Threader

Two new tools—plain and ratchet models—so unique in design that U. S. patents have been allowed on both. Dies are well above the tool body—chips can clear instantly—even long curling streamers from soft bolt stock cannot jam or clog these tools. Dies are easily oiled—resulting in better threads and longer die life. Dies changed in 20 seconds—no tools required. Dies adjustable for over or undersize threads—dies adjust as a single unit, insuring uniform cutting. A smooth-working universal chuck eliminates the nuisance of loose bushings. Threads pipe ⅛ to ¾ and bolts ¼ to 1-inch (by 16ths), right or left, NC and NF. Plain, $4.50; ratchet, $6.50. Each set of dies threads one size only. Dies, right hand, $1.50; left hand, $2.50, per set.

AT ALL LEADING SUPPLY HOUSES.
Write for new 1940 Catalog.

BEAVER PIPE TOOLS, INC.
240 Deen Ave. Warren, Ohio

NEW DRILL-POINT
SAVES HOURS OF DRILLING TIME

Amazing new drill-point contains special metal harder than hardest steel. Goes through concrete, tile, slate, porcelain, etc., 50 to 75% faster. Drills cleaner, more accurate holes. Speeds up installation of expansion anchors. Saves your skilled time for more profitable work. Eliminates noisy hammering, monotonous chiseling. Doesn't splinter fragile work. No special equipment needed—use in any rotary drill. Get *your* share of those extra profits now possible. Send coupon for leaflet.

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CARBOLOY
MASONRY DRILL-POINTS

used. A stable support, a platform raised to the proper height, will often insure good care.

A machine with a telescopic structure is being used for maintenance and cleaning in a number of plants and buildings. A small unit provides for an extension up to 15-ft. above the floor. Being only 32-in. wide the machine can be moved in a narrow aisle. Leveling screws are provided for use on uneven and sloping floors. Other machines are available for extensions up to 50-ft., for outdoor use and can be motor operated.

180-Cycle Tools Save Assembly Time

High-frequency tools have two advantages: (1) Those that operate at 180 cycles weigh approximately half as much as the 60-cycle power tools. (2) They reduce the time for respective operations because of their higher speeds.

These advantages have been an aid in the Diesel and tractor engine assembly at the Caterpillar Tractor Company in Peoria. About 36 tools are used on the 200-ft. assembly line. The electric tools are suspended from an overhead power trolley, and are supplied with 180-cycle, 220-volt power from a 40-hp. frequency-changer set. The set is mounted on a steel column near the assembly line and controlled from the floor.

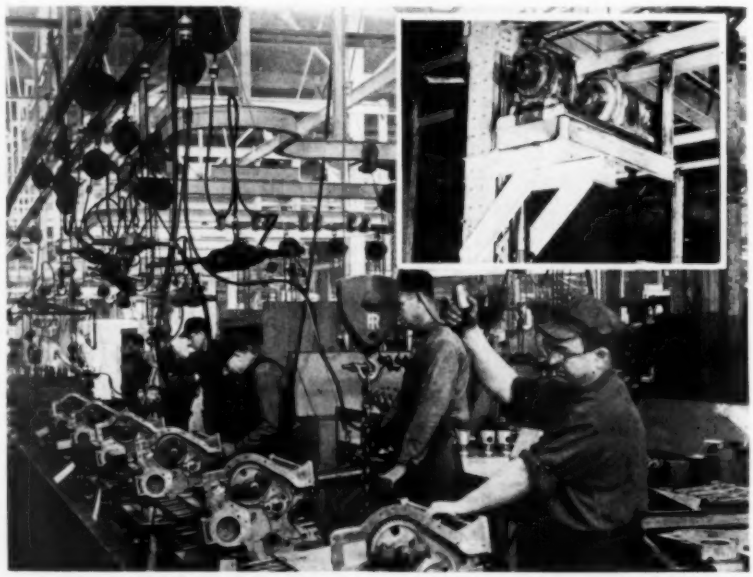
The connected load is 65 hp. for the 36 tools. This load exceeds the capacity of the frequency-changer set. But because all the power tools are not used at the same time, the 40-hp. set has ample capacity. However, if all the tools were operated at one time a much larger frequency-changer set would have been required.

Circuit Identification

Feeders and switches should be marked plainly for the circuits which they control. This is particularly important where electric motors are installed in various locations in industrial plants, commercial and institutional buildings. Some method of identification will save time spent in hunting and testing if trouble develops. Labeling should be plain, so that the maintenance man on duty or another authorized person will know which switch to open or close.

On a feeder to a department or a group of motors, the switch should be labeled so as to be distinguished from another for a circuit to one motor, such as "Feeder, Dept. 4." On the inside cover of the switch for a group feeder should be listed the motors, and the driven machines. The listing will aid in determining whether the opening of the circuit will stop a machine which should not be stopped unless it is necessary.

A switch for a single motor should have marked on its cover the name or number of the machine, such as "Compressor" or "Mach. 126." On the inside cover of the safety switch, there should be marked the size of the motor and the ampere rating of the circuit fuse.



HIGH-FREQUENCY POWER TOOLS *suspended from overhead monorail are used for driving studs and nuts on engines assembled at Caterpillar Tractor Co. Power at 180 cycles, 220 volts, is furnished by a frequency-changer set (see inset photo).*

New LEVITON 260 LINE OF TYPE C TOGGLE SWITCHES

Here is a new series of switches that can be loaded up to full capacity with ample safety—a durable, high speed, knife action type of mechanism designed for long life under all conditions. Large head 8-32 binding screws for easy wiring, and a sturdy strap, permanently fastened to the housing without screws, makes this switch trouble-free from loosening in service.

Use this new T-Rated line for your heavy Type C lamp loads.

★ *Note the raised toggle pad which assures quick wall plate alignment and keeps the toggle free from binding against the wall plate. This pad also protects the switch against dust and improves the appearance.*

Cat. No. 260—Single Pole—Rated 10A., 125 V.T
Cat. No. 261—Three Way—Rated 10A., 125 V.T
Cat. No. 262—Four Way—Rated 5A., 125 V.T

For residential, industrial use, or wherever wiring devices are needed the KWIKCHANGE line fits the job. Each combination can be easily assembled, in any desired scheme—and there are hundreds of combinations to suit all requirements and conditions. Bring your wiring job up to date with KWIKCHANGE.

See this display at your local wholesaler →

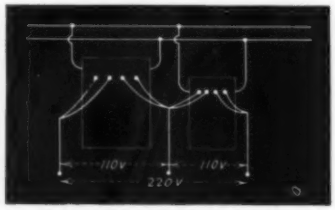
LEVITON MANUFACTURING CO.
236 GREENPOINT AVE., BROOKLYN, N. Y.
111 N. Canal St., Chicago, Ill. 420 S. San Pedro St., Los Angeles, Calif.

Questions ON THE Code

Answered by
F. N. M. SQUIRES
Chief Inspector New York Board of Fire Underwriters

Transformer Connections

Q. *"Will you please tell me why or how one 5 kva. transformer and one 1.5 kva. can be banked together? I hooked them up according to the diagram below and the small one got hot and had to be taken out of use."—O.S.*



A. If the transformer ratios are of the same order and designed and wound to deliver the same voltage, there should be no difficulty in connecting them up in parallel. Of course, the connections should be made in accordance with the manufacturer's diagrams which should be shown on a nameplate on each transformer.

Effect of No Inspections

Q. *"Is there any possible way to enforce the Code rules in the State of Maine in regard to wiring of houses? There are several so-called electricians in this section that laugh at the Code rules and do not follow them at all. For example, I found in a house just wired, no connection soldered or approved connector used, rubber tape on only the black wire, plates used instead of boxes and fastened in some cases, circuits not evenly or correctly arranged according to the load, range cable not securely fastened to entrance or to building."—R.B.C.*

A. Probably the only way to enforce compliance with Code rulings is for the state or its counties or cities to adopt ordinances requiring such compliance and providing for compulsory inspection. Such ordinances are often tied up with license regulations but not necessarily so.*

* The violations complained of are typical of conditions found on electrical work installed in a territory where there are no inspections. With the increasing number of electrical fires and mounting fire losses from these fires caused by electricity, remedial legislative action is imperative.

Power vs Bell Transformers

Q. *"In the Questions on the Code, page 1, covering low voltage wiring, I note you refer to power transformers and the fact that wiring in connection therewith must be in accordance with Chapter 3 of the Code with the exceptions noted in rule 8006.*

LAW MAKER, Bruce Hubbard, president, Peoples Electric Co., Endicott, N. Y., and Alvin Smith, electrical contractor, were the "fathers" of the local electrical contractor licensing ordinance. Bruce says that through the cooperation of the local authorities and strict application of the law, "basket contracting" is non-existent.

Would appreciate your comment on the following:

"1. Is it not a fact that most of the transformers used in connection with gas burner, and oil burner controls are this type, namely 'Power Transformers?' If so, then the same precautions are to be taken as for 110 volts, with the exceptions noted under 8006."

"2. What Code ruling governs whether a transformer is of the 'Power' type or the 'Signal' type and what reference is there in the Code that 'Power' type transformers shall be in accordance with rule 8006?"

"3. Is it not good practice to mount a small fused switch immediately adjacent to these jobs?"

"4. My biggest problem is to tell the gas people how to determine which is a power transformer and which is not, without each time referring to the Underwriters' List of Approved Appliances."—A.H.W.

A. 1. The National Electrical Code sets down requirements governing electrical installations. Among these requirements are rules governing the size, insulation and installation of wires and the ratings of devices for the protection of these wires. Unless exceptions are made, all wiring must conform to the general requirements. One set of exceptions has been made for Signal Systems under which temperature control circuits are classed.

If the circuits are limited as in paragraphs 8003b, 1, 2, 3 or 4, any type of wiring and insulation may be used. In these paragraphs will be noted the Code term for bell ringing transformers, which are mentioned as "transformers having inherent current-limiting characteristics" and also note the requirement that they may be "approved for the purpose." To all intent and purposes this means, listed by Underwriters' Laboratories.

A. 2. The answer to #1 to some extent also answers question #2. There is no reference in Section 8006 that "power transformers" shall not have inherent current limiting characteristics. If the transformer is not of the "Bell" type, then it is a "power" type and the wiring must comply with Chapters 1, 2 and 3 of the Code.

A. 3. It is a good practice to mount a fuse (enclosed) adjacent to the transformer and, of course, it is required, except where the current is derived from a "bell" transformer or similar current limiting device or from a primary battery. The installation of a switch in this circuit might introduce a hazard in that it might be inad-

UMI

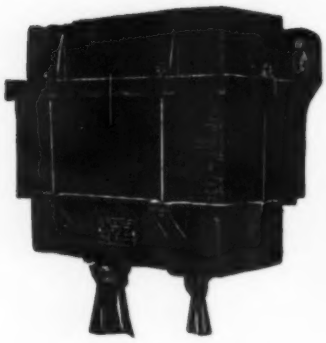
IS THIS FEATURE ON THE TIME-SWITCH YOU NOW BUY?

★ STURDY SILVER CONTACTS ASSURING EXCEPTIONALLY LONG CONTACT LIFE BY INTERRUPTING THE CURRENT FLOW IN LESS THAN HALF A CYCLE.

BECAUSE the contacts are vital points in any time-switch, the contact mechanism of Sangamo Time-Switches is designed for exceptionally long life. This design includes the use of pure silver contact buttons, and a patented lever action which, by providing a positive motion through a small gap, interrupts the current flow in less than half a cycle. Buy "Sangamo"—the time-switch that has *all* the essentials of a good time-switch: accuracy, dependability, convenience, *and longevity!*

SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS

FOUR POINT ECONOMY—



Below: Type CF, Single-phase, outdoor-type, air-cooled, general - purpose transformer.

Above: Type CFT, three-phase, outdoor-type, air-cooled, general-purpose transformer.

1 LOW INITIAL INVESTMENT

2 EASY TO INSTALL

3 MINIMUM MAINTENANCE

4 EFFICIENT IN OPERATION

Whenever it is desired to obtain a low-voltage supply from a higher voltage circuit you will find AmerTran Type "CF" Air-Cooled Transformers both economical and convenient to use. These moderately priced units may be installed wherever they are needed—either outdoors or indoors*—without the necessity of oil, fire-proof vaults or enclosures. All sizes are equipped with either conduit fittings or a built-in junction box to facilitate installation, and both single-phase and polyphase types are furnished as a single unit. Available in capacities up to 100 Kva. and for potentials up to 2400 volts, all ratings offer low initial investment, minimum installation and maintenance expense, and low operating cost. Let us send data on equipment to meet your needs. Ask for bulletin 1116A.

* Units rated 15 Kva. and larger for indoor service only.

Type "CF" Applications

1. Stepping down power circuit voltage to 115/230 volts for lights, small motors or heating elements. In this way advantage may be taken of lower power rates for low-voltage loads.
2. Obtaining a 3-wire circuit from a 2-wire system.
3. Changing from 3 phase to 2 phase, or vice versa, on a power system.
4. Obtaining low voltage for heating, welding, 32-volt tools, special lighting, testing, etc.
5. Balancing load on 3-phase systems.
6. Insulating one circuit from another.
7. Distributing power at 600 volts or less.
8. Reducing light flicker.
9. Obtaining special voltages to permit efficient operation of equipment.

AMERICAN TRANSFORMER COMPANY

178 Emmet St. Newark, N. J.

PRODUCTS

American Transformer Co. manufactures transformers for every industrial, electronic and laboratory application in sizes up to 10,000 Kva and for potentials up to 132 Kv. Other products: voltage regulators, test sets, rectifiers.

AMERTRAN TRANSFORMERS

Manufactured Since 1901 at Newark, N. J.

Questions on the Code

[FROM PAGE 54]

vertantly opened, thus rendering the control circuit inoperative.

A. 4. The Laboratories require that the word "Bell" appear on each approved bell ringing type of transformer at the secondary leads. If it does not have this, then it should be treated as a power transformer. But reference to the List should be made to ascertain the approval of the device.

Soft or Hard Copper

Q. *"Why were the words 'Soft Drawn' deleted from the 'Code'? Why do we now get 'Semi-hard drawn copper' for all inside work? The present 500,000 CM Cables can not be drawn into a 3-in. conduit having more than one elbow. Hard drawn wire is the reason, after six months' time, the separation between copper and conduit is 'braid' only, due to the continued stress of the hard wires. The 3-in. conduit is code for 3–500,000 CM cables"—J.T.C.*

A. The requirement for "soft drawn" copper wire has been deleted from the Code because the standards of Underwriters' Laboratories permit the use of only soft drawn copper in the manufacture of all rubber covered wires. Therefore if wires of hard drawn copper are found, the fact should be reported to the local inspection bureau or to Underwriters' Laboratories.

DUAL APPROACH to electric cooking prospects has contractor-dealers in New York's Hudson Valley out selling all sizes of customers. Here is J. W. (Jack) Cavo of Cavo & Donegan, Pleasant Valley, N. Y., with the latest roaster-hot plate table combination. It is for lower income town and rural prospects, who are unable to tackle the purchase of an electric range. A 10-gal., 1,500-watt, 115-volt water heater is also being sold to quite a few of these customers.

A recent FA Busduct Installation —
BURDINE'S Department Store
Miami, Florida
Architect: E. L. Robertson
General Contractor: Rodney Miller
Electrical Contractor: George La Vigne

THE BEST BUSDUCT INSTALLATION IS ONE THAT IS MADE FOR THE JOB

No two installations are exactly alike. Each should be planned with its particular problems in mind. So, while

FA BUSDUCTS

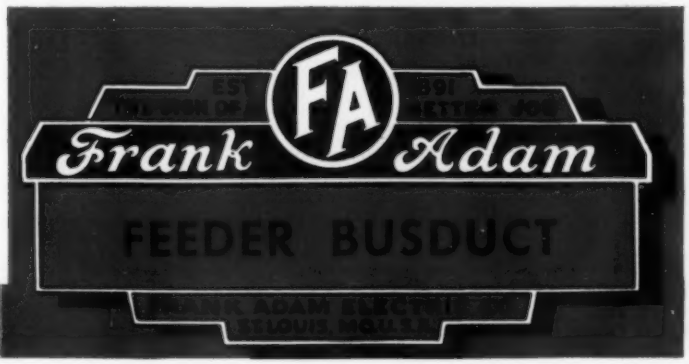
are standardized, their design and construction permit of deviation from the normal that add greatly to their elasticity in installation, and their convenience in use. They form the ideal method of distribution for large jobs. We have built busduct systems carrying up to 12,000 amperes.

Housings of FA Busducts are of steel or aluminum up to 2,000 amperes—always of aluminum over 2,000 amperes. FA Busducts are completely engineered in every detail to render the most satisfactory service.

SALES-ENGINEERS SPECIALIZE

in distribution problems. Their experience—together with that of the entire FA organization — is yours for the asking.

FA Sales-Engineers are located in the principal cities. Make it a practice to consult with them. It takes a lot of work and worry off your shoulders—and assures adequate quotations and a workmanlike job that will help maintain the reputation that you have so carefully built. . . . Send for Catalog 56. . . . Frank Adam Electric Company, St. Louis, Mo.

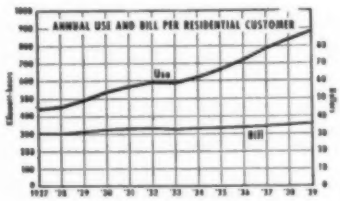


In the News

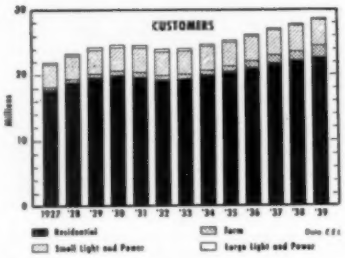
POWER COMPANY GROWTH

The power companies have had their troubles during the past ten years, but lack of business has not been one of them. "Electrical World's" annual statistical review, published January 13, presents a dramatic picture of continuing progress. The total production of electrical energy diminished slightly from the beginning of 1930 until the spring of 1933. Since then the curve has climbed, with spring dips in 1938 and 39. Today it stands at an all time high.

Over this decade, while general business has been struggling with red ink, from lack of volume, the power companies have gained 4,600,000 new customers and increased their sales per customer. The bulk of it has come, by energetic selling of appliances to homes and larger lamps to commercial customers.



THE DOMESTIC LOAD—The householder continues to pay about the same bill for electric service but he is using twice as much current as he did in 1927 and he has done almost nothing to his wiring. That's why voltage is down in most homes, why re-wiring must begin soon in a big way.



WHO BUYS OUR JUICE—The consumption of energy by classes of customers through the past decade. Study the notable growth in domestic load by 20,000,000 customers.

Over the ten years, the generating capacity of the power industry has been increased 26.8 per cent, the output 36.4 per cent. Energy sales have grown 43 per cent. Farm sales and residential sales have nearly doubled. Commercial sales have jumped by 52 per cent, industrial more than 10 per cent.

The average residential customer's consumption has increased 80 per cent but his bill is only 16.4 per cent higher. The average rate for domestic service stands at a new low of 4.05 cents.

The year 1939 presented some notable figures. Output was 13 per cent over 1938, with energy sales up 13.5 per cent, which is 7 per cent over the previous high established in 1937. Revenues were up 6 per cent and they connected 900,000 new customers.

Some 340,000 farmers were taken on the lines, which was more than double the number in 1938. The total of all rural customers using electric service is now 1,800,000. About 400,000 are on REA lines, while 1,400,000 are served by power companies. Some 555,000 residential customers were added by the Utilities last year.

The power industry spent only $16,000,000 in new money last year. Larger programs are looked for in 1940 as they expect to add 1,285,000 kilowatts in new capacity.

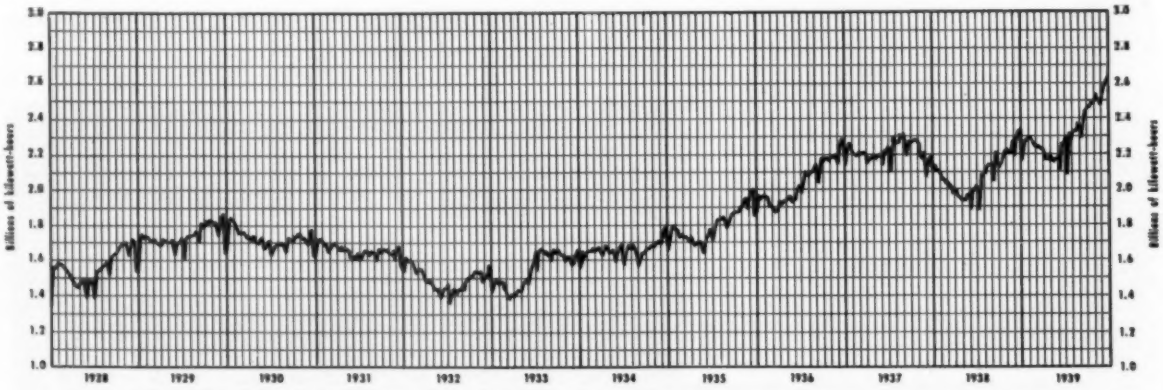
The electrical manufacturing business was up 25 per cent in production and this year it will probably exceed 1929, with increases of from 5 to 20 per cent in different classes of products.

All this translates itself naturally into terms of more wiring, more work for the electrical contractor. It has created more need for electrical construction, more opportunity. This new added market breaks down into localities. And the answer for the individual contractor in any city lies in the record of his local power system. These local figures should also be studied.

THIN INSULATION RAISES QUESTIONS

Approval of thin wall insulation building wire by the Electrical Committee NFPA in December has raised up a variety of new problems that are perplexing electrical men. The 1940 National Electrical Code is not yet edited for publication. When it is, it must be approved by the National Fire Protection Association before it is printed. But many cities are already issuing regulations.

Portland, Oregon; Salt Lake City, Davenport, Ia.; Madison and Racine, Wis.; Chicago, Peoria, New Orleans and Richmond have authorized its use under the conditions laid down by the Electrical Committee. Many other cities are expected to follow as local inspectors get



HOW WE GROW—Weekly production of electrical energy in the United States from 1928 to 1939 in billions of kilowatt hours. We see a few dips in the worst part of the hard times. But all in all it is a proud record of continuous growth and on this growth the prosperity of the electrical industry is founded. (Charts courtesy of "Electrical World.")

MEMO

TO: J. G. BAILEY, President

I think Automatic's got something here-we ought to be selling these telephones.

How about it?

Don Donaldson
Sales Manager

Don - Good idea - let's go! J.G.B.

ELECTRICAL SUPPLY COMPANY

ATIC ELECTRIC
NE SYSTEMS
PROFITS

Right now you are serving scores of concerns whose efficiency can be stepped way up with fast interior telephone facilities. By telling them about the Automatic Electric line, you not only get in on some profitable new business, but you perform a genuine service for them as well.

Your market is as broad as business itself. All offices, shops, factories and residences are good prospects. And right now is an especially good time to push private telephones because business is distinctly communication conscious.

Automatic Electric makes private telephone systems to fit every need. Shown below are four of the many types available. Our distributor in your territory will gladly supply you with literature, prices and discounts, as well as work with you on specific jobs. Talk to him.

INTERCOMS

Available in both desk and wall styles. Equipped with molded plastic handsets. Common talking systems of two to eleven stations.

SERV-U-FONES

Low priced, all metal telephones, in common talking systems of two to ten stations. Conveniently packaged and simple to install.

IDEALFONES

Compact, wall type telephones with molded handsets. Offered with one or five buttons for common talking service up to ten stations.

P-A-X's

Private automatic exchange systems, providing dial service and secret connections, from ten stations up. Telephones in a variety of types.

These systems are designed for private service. They are not intended to be connected with the public telephone system.

AUTOMATIC ELECTRIC

PRIVATE INTERIOR TELEPHONE SYSTEMS

Distributed by: **AMERICAN AUTOMATIC ELECTRIC SALES COMPANY**, 1033 West Van Buren Street, Chicago, Illinois
Sales and Service Offices in Principal Cities • In Canada: Canadian Telephones & Supplies, Limited, Toronto

In the News

[FROM PAGE 58]

around to it. But New York will take no action until the new wires are submitted for approval and standards are established to govern approvals. Still other cities will probably adopt the same policy. The situation is this—

Type RH, heat resistant rubber insulated wire "having a flame retarding and moisture resistant fibrous covering, with insulation of 1/32 in. wall thickness for sizes 14, 12 and 10 AWG and 3/64 in. wall thickness for No. 8" is approved for use in place of Type R wire. It is available under established Underwriters Laboratories standards. Practically all the regular manufacturers are expected to make this wire.

Latex insulation "with a minimum thickness of 0.018 inch of 90 per cent unmilled grainless rubber may be used, provided such conductors have a flame retarding and moisture resisting fibrous covering and have been listed by Underwriters Laboratories for the purpose intended"—limited to 60 deg. C and 600 volts. United States Rubber and Simplex are, at present, the only manufacturers of this thin insulation, a patented product.

Another possibility is the new "Dilec" wire with a cotton wrap with binder thread to replace the usual braided covering with an appreciable reduction in the diameter of the wire. This has been developed by National Electric Products. U. S. Rubber and Roebling are licensed to manufacture it also.

"Solid synthetic insulation without fibrous covering is approved for changes made in existing raceways only, provided that such conductors have been listed by Underwriters Laboratories for the purpose intended—limited to 60 deg. C and 600 volts. The use of such synthetic insulation is open to any manufacturer but no standard has been established, so far, under which this wire covering can be approved by Underwriters Laboratories.

Moreover, "for conductor changes in existing raceways," where a conduit fill of 50 per cent of the cross sectional area for three wires or more, has been approved, action waits upon final development of official temperature tables to govern the carrying capacity of conductors.

Inquiry among the wire manufacturers shows considerable uncertainty in present plans. Many report stock on hand ready to ship Type RH. Makers of Latex (and "Laytox", the Simplex name) are now actively in the market. Some companies offer to ship synthetic wire but know that the basis of local approval still waits on a definition of this insulation, under which it may be listed by Underwriters Laboratories. Some say they expect to be ready for business about May.

Meanwhile, rewiring jobs are reported about the country where old conductors are said to be coming out to be replaced by small diameter wire. Four jobs in Chicago are definite but others, appear to be still in the talking stage, stimulated by power company promotion and the eagerness of contractors to see this market open up.

The interest of contractors is growing apace as they think further into the possibilities offered in the rewiring of commercial buildings. They are conscious of unexplored problems in pulling wires out and into old pipes where corrosion has destroyed interior surfaces. But they also see involved in these rewiring jobs much relocating of outlets and installing of new equipment. For more wire capacity will call for larger switches, feeders and panelboards, capable of carrying heavier loads. This rewiring business, they are beginning to see, will bring with it a wide sweep of replacements and much selling of new auxiliary equipment.

"CODE SHOULD DEFINE REWIRING!"

New England inspectors would have the Code decide what wiring jobs should be classed as new or rewiring and not leave the decision to local inspectors. This demand came in the course of a full day meeting of the New England Chapter IAEI in Boston, January 17.

It was also the consensus of opinion that armored cable can meet the code requirement of a resistance rating of 1.5 ohms per 100 ft. without the use of an extra bond on the inside. This could be achieved, it was argued if manufacturers would lay stress on flexibility and turn back toward tighter locking of armoring strips.

Inspector Fanton of Fall River occupied the chair. The Code amendments recently adopted by the Electrical Committee NFPA were explained at length. H. H. Weber, commercial engineer, United States Rubber Co., New York; and E. W. Davis, chief electrical engineer, Simplex Wire & Cable Co., Boston, were prominent speakers.

ADEQUACY ADVOCATE, R. Koch of Lawrence Electric Co., Yonkers, N. Y., talks and sells additional outlets to Yonkerites. "The main objection to more outlets is installation damage to finished rooms," says Mr. Koch, "and we guarantee to keep them unharmed. You just have to know house construction to do that." And judging from the work he is getting, he does.

"The electric eye is fixed, but now the door opens the wrong way!"

FLUORESCENT EQUIPMENT NOW CERTIFIED

The Electrical Testing Laboratories is now testing and certifying fluorescent lighting equipment Specifications to produce efficient, durable and safe lighting equipment are being set up for the manufacturers. They are tentative and will be revised as the fluorescent lighting art advances. Test and research data, are being sent to the co-operating manufacturers, thirty-four of whom are now submitting their products for test and certification. It is expected that the certified products will be marketed under the name of "Fleur-O-Lier."

Electrical Testing Laboratories has recently announced certification of the products manufactured by: G. A. Collier, Inc.; Curtis Lighting, Inc.; Dean H. Holden; and the F. W. Wakefield Brass Co. Additional certifications will be announced shortly.

HAZARD
ARMORED CABLES

Hazard Armored Thermocable
has heat-resisting rubber insulation on each conductor, colored for identification, and armored for mechanical protection. Insures positive operation of control apparatus for heating and air-conditioning systems and units.

Hazard Armored Cable, Type AC
has a flame-resisting, moisture-proof paper sheath between the conductors and spiral interlocked steel armor. A ripcord beneath the paper facilitates installation. The insulating bushing is inserted at cut ends over paper sheath.

Hazard Armored Ground Wire
with tinned copper conductor without insulation, armored for protection. The armor makes grounding assurance doubly sure.

Hazard Flexible Steel Conduit
is offered as a single unit. This strong but flexible conduit saves time and expense for short runs, or where many bends must be made.

A complete line carried by
ELECTRICAL JOBBERS

ADEQUATE WIRING SERVES AND SAVES

HAZARD INSULATED WIRE WORKS

DIVISION OF THE OKONITE CO.

WORKS: WILKES-BARRE, PENNSYLVANIA

New York Chicago Philadelphia Atlanta Pittsburgh Buffalo Boston Detroit Seattle Dallas Washington Cleveland San Francisco St. Louis Los Angeles

Positive Protection with

"EVER-LOK"

PLUGS • RECEPTACLES AND CABLE CONNECTORS

From 10 to 200 amperes—440 volts

SIMPLE—SURE—ECONOMICAL

LOCKS AUTOMATICALLY

RUSSELL & STOLL CO., INC.

150 Park Place New York, N. Y.

How to wire for light and power . . .

Step-by-step methods fully and simply explained in this new book

Just Out H. P. Richter's

PRACTICAL ELECTRICAL WIRING

Residential, Farm, and Industrial

500 pages, 5½ x 8
illustrated
$3.00

Covers:

I. Underwriters and codes; electrical principles and measurements; basic devices and circuits; wire, sizes and selection; connections and joints; residential and farm motors; etc.

II. Planning an installation; specific outlets; switches and other devices; old work; farm wiring; isolated lighting plants; wiring apartment houses; etc.

III. Planning non-residential installations; non-residential lighting; miscellaneous problems; wiring for motors; wiring schools, offices, stores, churches; etc.

HERE is a complete course of instruction for those who want to learn how to do electrical wiring. Begins with very first elements and takes the reader by easy steps, plain instructions and methods, to the completion of typical wiring jobs in accordance with official requirements. Employs simple language; confines mathematics and theory to the minimum necessary for understanding of the work; covers medium voltage jobs of the types that are most in demand.

10 DAYS' EXAMINATION—SEND THIS COUPON

McGraw-Hill Book Co., 330 W. 42nd St., N. Y. C.

Send me Richter's Practical Electrical Wiring for 10 days' examination on approval. In 10 days I will send $3.00, plus few cents postage, or return book postpaid. (Postage paid on orders accompanied by remittance.)

Name .....

Address .....

City and State .....

Position .....

Company EC-2-40

(Books sent on approval in U. S. and Canada only.)

In the News

[FROM PAGE 60]

NEW NAME FOR McCARTHY-FORD

McCarthy Brothers and Ford of Buffalo, an old, successful and prominent electrical concern, combining a large construction business with a large wholesale supply house, announces a change of name for each division. The wholesale business will hereafter be called Buffalo Electric Co., Inc. It continues at the same address, with no change in management, ownership or personnel.

The contracting business, formerly called the McCarthy-Ford Electric Company, will take the old parent name of McCarthy Bros. and Ford. This name will, therefore, be used in future only for the company's electrical contracting business.

LIGHTING FIXTURES MUST BEAR LABEL

The New York Board of Fire Underwriters have just issued a bulletin stating that [illegible] April 1, 1940, electric lighting fixtures shall be listed by Underwriters' Laboratories, Inc." Until that time the present bulletin covering approval of fluorescent lighting fixtures, will be in effect.

COMING MEETINGS

National Electrical Manufacturers Association—Mid-Winter Conference, Waldorf-Astoria Hotel, New York, Feb. 5–9.

Minnesota Electrical Trade Exposition and Convention Week—St. Paul Hotel, St. Paul, Minn., Feb. 12–15.

Minnesota Electrical Council—St. Paul Hotel, St. Paul, Minn., Feb. 12–15.

National Industrial Service Association, Inc.—Annual Convention, Book-Cadillac Hotel, Detroit, Mich., April 22 to 24.

National Electrical Manufacturers Association—Spring meeting, The Homestead, Hot Springs, Va., May 12–17.

National Electrical Wholesalers Association—Annual Convention, The Homestead, Hot Springs, Va., May 19–23.

L. A. CONTRACTORS JOIN MAINTENANCE ASSO.

Committees from the NECA, Los Angeles chapter, and the Electric Maintenance Engineers Association of that city, recently met at a very friendly session. Frankness prevailed in the discussion.

To the contractors' surprise, the maintenance engineers complained that they had no way of knowing which contractors to trust. Their experience had been disappointing. Many of the journeymen employed by contractors had done unreliable work. Some contractors had tried to

Electrical
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THERE'S NO SUBSTITUTE FOR QUALITY
.... and with the KNOX LINE you get quality .... plus service ... plus satisfaction and the advantage of buying more items on one order than from any other manufacturer.
We illustrate here a few of the more than 600 items shown in our 72 page catalog. A copy is yours for the asking.
Sold through jobbers everywhere.
KNOX PORCELAIN CORPORATION
KNOXVILLE, TENN.
The Complete LINE

The uniform high quality of G-E Building Wire makes installation easy and helps to assure long dependable service. The best raw materials are used. Manufacturing is carefully done.

All grades of G-E Building Wire are easy stripping, clean stripping and easy pulling. All grades have uniformly small diameters. Every wire carries the grade of insulation, type, voltage and size printed right on the braid. Different colored braids are available.

For more information see the nearest G-E Merchandise Distributor or write to Section W-0122, Appliance and Merchandise Dept., General Electric Co., Bridgeport, Conn.

GENERAL ELECTRIC

In the News

[FROM PAGE 62]

cheapen the job. The maintenance engineers were emphatic in saying they wanted the best of materials because a good installation requires less repair work and makes maintenance easier.

To the contractors' question about their doing their own wiring with their own crews, the maintenance engineers admitted they did such work but did not want to. Some of them recited a list of large improvement jobs that their plants had recently given to electrical contractors.

As the result of this conference, six of the large industrial contracting firms in Los Angeles joined the Electric maintenance Engineers Association. These were Quality Electric Co., Ltd.; Littlejohn and Reuland; Smallcomb Electric Co.; R. A. Reed; Norton and Norton; and Hill Electric Company.

Instead of a Christmas party, the Maintenance Engineers this year held an informal table exposition. Every manufacturer member and contractor member was offered the opportunity to use a table space of 30 by 60 in. for displaying wiring materials, catalog sheets, devices, instruments, or anything else of interest. Then a buffet dinner was served.

YOUNGHOLM HEADS NEW YORK GROUP

David S. Youngholm, vice president, Westinghouse Electric and Mfg. Co., was elected president of the Electrical and Gas Association of New York, Inc., at its annual meeting.

Other officers elected were: First vice president, J. H. McKenna, Knapp-Monarch Co.; second vice president, Clifford E. Paige, Brooklyn Union Gas Co.; third vice president, T. F. Barton, General Electric Co.; fourth vice president, Leslie C. Boyd, Van Cortlandt Appliance Corp.; treasurer, S. J. O'Brien, S. J. O'Brien Sales Corp.; secretary, Harry J. Calahan, General Electric Supply Corp.; assistant secretary, James W. Carpenter, Long Island Lighting Co.

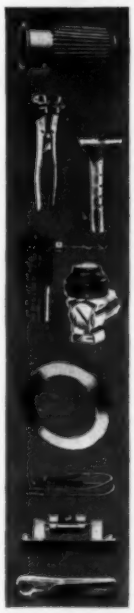
COOK COUNTY CONTRACTORS RE-ELECT '39 SLATE

Annual ballot of members of the Cook County (Chicago) Electrical Contractors Association returned the full roster of 1939 officers to their posts for 1940.

Re-elected were: W. J. Templeman—Premier Electric Construction Co., President; Max G. Jahns—Harrison Electric Construction Co., Vice President; A. L. Simons—Clark Electric Co., Secretary; E. J. Ermel, Metropolitan Electric Co., Treasurer.

Board of directors for 1940 are A. J. Bambula, J. M. Braverman, John Buck,

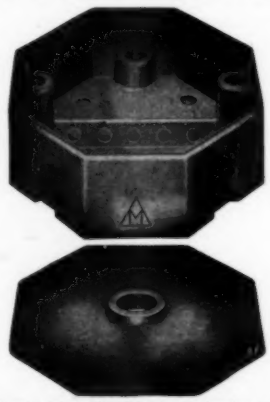
SPEED UP YOUR PROFITS with IDEAL



1. Wire-Nuts
Save on materials—no solder, no tape, no blow torch or fuel. Get a quick O.K. from the inspector or owner. No trouble, no bother. Better electrically—stronger mechanically. A size for every common wiring joint.
2. "E-Z" Wire Strippers
Neatly, easily strip toughest insulation without nicking or cutting strands. Strip solid or stranded wires from No. 20 gauge to No. 5.
3. Cable Ripper and Wire Gauge
Cleanly rips non-metallic sheathed duplex or lead covered cable. Case-hardened cutting point gives long service.
4. Joist Boring Machine
Bores holes at any angle. Operates from floor—eliminates climbing up and down ladder, dangerous reaching, back-breaking effort. Quickly adjustable for overhead work up to 11 feet.
5. Fuse Clip Clamps
Cut down resistance between clips and fuses, insuring 100% contact. Insulated skirt protects fingers from live parts. Seven sizes for gripping wide or narrow Ferrule or Knife Type Clips.
6. Fish Tape Reels and Pullers
No expensive tape breakage—no live contacts. Cost and trouble of fishing reduced to a minimum. Available in 7 sizes. Junior Size $2.50 with 50 ft. of tape.
7. Test Lite and Fuse Puller
Handy pocket size combination tool tests live circuits and pulls fuses.
8. Fuse Reducers
Protect over-fused circuits. All sizes available.
9. Fuse Pullers
Eliminate danger of pulling and replacing cartridge fuses by hand. Made of laminated fibre in 4 sizes.

IDEAL SOLD THROUGH JOBBERS
Electrical Products Division
IDEAL COMMUTATOR DRESSER CO.
1041 Park Avenue Sycamore, Illinois

Profit by USING
ILLINOIS
Dependable Porcelain
OUTLET BOXES

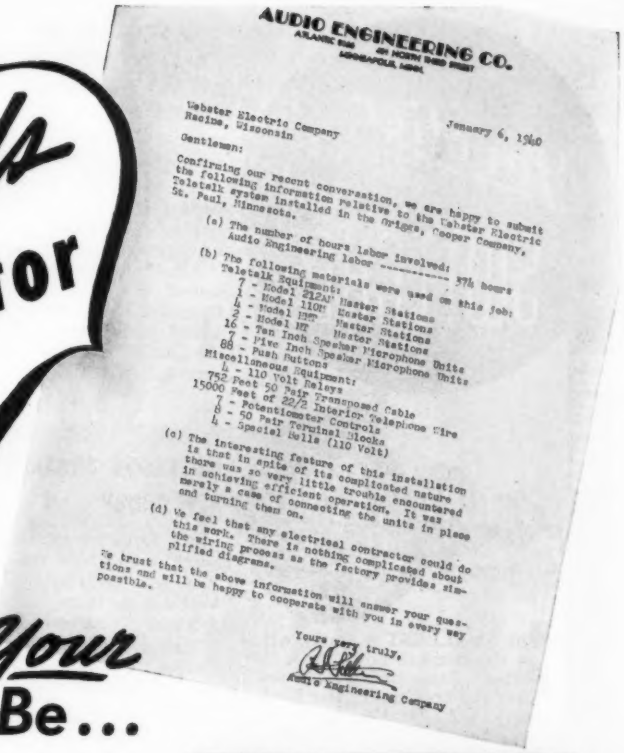


*** Glazed and unglazed styles conforming to all existing standards of dimensions, spacing, position of knockout holes, and mounting screws. High mechanical and electrical efficiency.**

Contractors who use these products not only establish themselves most securely with their customers but also build their business by making each job a true quality one. Send for bulletin.

ILLINOIS ELECTRIC PORCELAIN CO.
MACOMB, ILL.

Here's a *Bill of Goods* Any Contractor Can Sell!



AUDIO ENGINEERING CO.
ATLANTIC BLDG. 430 NORTH THIRD STREET
MINNEAPOLIS, MINN.

Webster Electric Company
Racine, Wisconsin

January 6, 1940

Gentlemen:

Confirming our recent conversation, we are happy to submit the following information relative to the Webster Electric Teletalk system installed in the Griggs, Cooper Company, St. Paul, Minnesota.

(a) The number of hours labor involved: Audio Engineering labor ---------- 87½ hours

(b) The following materials were used on this job:
Teletalk Equipment:
7 - Model 212W Master Stations
1 - Model 110H Master Stations
4 - Model 110M Master Stations
2 - Model 109M Master Stations
16 - Ten Inch Speaker Microphone Units
7 - Five Inch Speaker Microphone Units
86 - Push Buttons
Miscellaneous Equipment:
4 - 110 Volt Relays
752 Feet 50 Pair Transposed Cable
15000 Feet of 22/2 Interior Telephone Wire
7 - Potentiometer Controls
8 - 50 Pair Terminal Blocks
4 - Special Bells (110 Volt)

(c) The interesting feature of this installation is that in spite of its complicated nature there was so very little trouble encountered in achieving efficient operation. It was merely a case of connecting the units in place and turning them on.

(d) We feel that any electrical contractor could do this work. There is nothing complicated about the wiring process as the factory provides simplified diagrams.

We trust that the above information will answer your questions and will be happy to cooperate with you in every way possible.

Yours very truly,
Audio Engineering Company

Figure What *Your Profit* Would Be...

WEBSTER ELECTRIC
Teletalk REG. U.S. PAT. OFFICE
Amplified Intercommunication

HERE is tangible proof that there is money in the sale and installation of Teletalk for any contractor!

The Griggs, Cooper Company, St. Paul, Minn., needed an intercommunication system to enable them to get the utmost efficiency out of a new, complex conveyor system.

After investigation, they chose Teletalk. It was sold and installed by the Audio Engineering Company. The letter shown above tells the whole story. It shows the number of Teletalk units, the hours of labor and the amount of installation material required for this job. Figure out for yourself, what *your* profit would have been on this job and you will have a good idea of the profits there are in Teletalk.

You can sell jobs like this—many contractors are doing it. If you are not familiar with this new method of amplified intercommunication and how it can be sold to both large and small businesses, write us for literature and the name of the nearest Teletalk distributor.

WEBSTER ELECTRIC COMPANY, Racine, Wisconsin, U. S. A.
Established 1909. Export Dept.: 100 Varick St., New York City.
Cable Address: "ARLAB", New York City

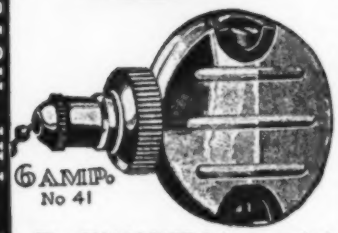
Licensed by Electrical Research Products, Inc., under U. S. Patents of American Telephone and Telegraph Company and Western Electric Company, Incorporated

Webster Electric

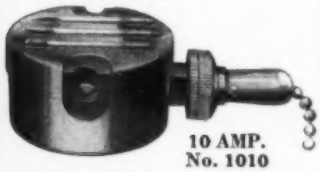
"Where Quality is a Responsibility and Fair Dealing an Obligation"

MANUFACTURERS OF IGNITION TRANSFORMERS AND FUEL UNITS FOR OIL BURNERS • TELETALK INTERCOMMUNICATION AND PAGING SYSTEMS • POWER AMPLIFIERS AND SOUND DISTRIBUTION EQUIPMENT • RADIO PHONOGRAPH PICKUPS

Levolier
SWITCHES
FIXTURE CANOPIES • CONDUIT BOXES • FHP MOTORS



The SMALLEST 6-Amp. switch on the market now has a "T" rating! Same price . . . same size, but now under the Underwriters' "T" rating the No. 41 Levolier Switch will take the initial surge of 48 Amps. from a cold, Type C lamp, eight times its rated capacity—(6-Amps., "T," 125 Volts; or 3-Amps., 250 Volts). With further improvements, this sturdy little switch has been made even more rugged. Used on small power apparatus and for individual control of lighting fixtures in industrial plants, commercial institutions and public buildings.



10 AMP.
No. 1010

The McGILL Levolier No. 1010 Switch shown above is designed for heavy duty 10-Amp. service. Listed by UL under the "T" rating, this single pole type is designed expressly for safe, positive control of modern high watt and high intensity lamps. Also adaptable to a variety of other uses. Equipped with plain levers, fibre levers or cord controls. Order these switches from your jobber—his stock is complete!

(Listed by Underwriters' Laboratories)

McGILL MANUFACTURING CO.
Box No. 670
VALPARAISO, INDIANA

McGILL

In the News

[FROM PAGE 64]

Emil DeHaan, Elton A. Gould, Jr., W. Hultgren, Joseph Kunst and George W. Reinke. Herbert Binner as Executive Secretary, will continue to direct the central services of the organization.

The 1940 directors and officers were installed by W. T. Stuart of "Electrical Contracting" in a ceremony celebrating the second anniversary of the organization at the Chicago Electrical Association on January 8.

MUSKEGON ORGANIZES A-W GROUP

All the local contractors were among the 40 members of the electrical industry who gathered recently at Muskegon, Michigan to launch an Adequate Wiring program. A committee of six headed by Stanley Johnson of the Consumers Power Co., will formulate the plans. Mr. Johnson will also serve as field man in the wiring activity.

CENTRAL NISA CHAPTER ELECTS FERRARI

Joe Ferrari, popular executive of the Excel Electric Service Company of Chicago, was elected president of the Central District Chapter of the National Industrial Service Association at a meeting in Chicago on January 9.

Balance of the slate for 1940 are: E. J. James, Northwestern Electric Co., vice-president; Burton Hohman, Hohman & Hill, Inc., secretary; James J. Smat, Queen City Electric Co., treasurer; and Directors, Eugene J. Thayer, Thayer Electric & Machinery Co. and P. H. Guion, Scott Pillar Electric Co.

WISCONSIN CONTRACTORS MEET

The Wisconsin Electrical Association, state organization of electrical contractor-dealers held their annual convention at the Hotel Schroeder in Milwaukee on January 26-27. The sessions were preceded by a Board of Directors meeting.

Among the high spots in the convention program was a discussion of the forthcoming 1940 National Electrical Code and the markets open to contractors through approval of the new thin insulation conductors.

Climaxing the social activities of the convention was the annual dinner dance in which the Wisconsin Electrical Association combined with the Electric League of Milwaukee drawing an attendance exceeding 500.

MINERALLAC HANGER

Conduit 3/8"—2 1/2"
Cable to 2 1/8" (with Bushings)

Cadmium and Everdur
MINERALLAC JIFFY CLIP

Sizes from .250" O.D. Tubing to 1 1/4" conduit.

See your Jobber

New York City Office
Theodore B. Dally
50 Church Street

MINERALLAC ELECTRIC CO
25 N. Peoria St., CHICAGO

List Price $9.95

NEW
an ideal leader for
YOUR 1940 FAN LINE!

Here's a streamline 10-inch COOL SPOT oscillating fan that through the use of heavily pitched, quiet type fan blades and slow speed Induction motor delivers 610 C.F.M. and is unusually efficient and quiet . . . adjustable for oscillating or non-oscillating operation. Its other features mark this fan as dependable quality at the right price. See your jobber now, or write for complete details.

SIGNAL ELECTRIC MFG. CO.
MENOMINEE, MICHIGAN
Offices in all principal cities

SIGNAL

For high lighting efficiency and low annual costs..

ALZAK® ALUMINUM REFLECTORS

High efficiency, permanence, ease of maintenance; that's what you get in Alzak Aluminum Reflectors.

High reflectivity is obtained by a special electrolytic treatment of polished Aluminum sheet. This surface is protected by a smooth, oxide coating of glasslike hardness, to which dirt does not cling. It won't chip, doesn't scratch easily and can be readily cleaned by washing with soap and water.

Alzak reflectors cover a series of finishes, each suited to a different use. You can obtain bright, specular finishes or matte, diffuse surfaces. Reflectors can be supplied for ordinary indoor service or for exposure to the corrosive conditions encountered out-of-doors and in certain manufacturing processes.

Whatever your use, *specify the right Alzak finish.*

MADE BY:

Crouse-Hinds Company	Syracuse, N. Y.
Curtis Lighting Company	Chicago, Illinois
General Electric Company	Schenectady, N.Y.
Edwin F. Guth Company	St. Louis, Mo.
Kliegl Brothers	New York, N. Y.
Major Equipment Company	Chicago, Illinois
Miller Company	Meriden, Conn.
S & M Lamp Company	Los Angeles, Cal.
Thomas A. Edison, Inc.	West Orange, N. J.
Westinghouse Elec. & Mfg. Co.	Cleveland, O.

We do not manufacture reflectors. The companies listed above, licensed under Aluminum Company of America patents, are well able to take care of your requirements.

ALCOA ALUMINUM Reg U S Pat Off

® REG. T. M., ALUMINUM COMPANY OF AMERICA

ALUMINUM COMPANY OF AMERICA
1946 GULF BUILDING • PITTSBURGH, PA.

FLOOR BOXES *and* WIRING SPECIALTIES

No. 285 Double Duplex Receptacle Nozzle

The most attractive, compact and easy-to-install fitting on the market. Shown in illustration with No. 200 Cover Plate.

No. 284 Duplex Receptacle Nozzle

With ½" brass pipe extension. Neatest and most compact fitting obtainable. Also available with ¾" pipe extension. Fullman also offers Duplex Telephone Nozzles.

No. 130 Adjustable Water Tight Floor Box

No. 130 Box with No. 207 Bell Nozzle. Cut-away view illustrates how tapered unit receptacle fits tapered opening in adjustable ring. Cover plate 3½" — overall height 3½".

• The *Latrobe Line* is complete for all residential, commercial, and industrial requirements. In addition, the entire line is designed with the idea of reducing installation time . . . an important point to consider when selecting floor boxes and wiring specialties

Write for details TODAY!

FULLMAN MFG. CO.

LATROBE • PENNA.

In the News

[FROM PAGE 66]

CESA AUTHORIZES TESTING

The Canadian Engineering Standards Association will establish laboratories to test and approve electrical equipment to comply with the Canadian Code.

W. P. Dobson, Hydro-Electric Power Commission of Ontario; B. G. Ballard, National Research Council and the CESA secretary comprise an Administrative Board.

WITH THE *Manufacturers*

Square D Merger

On December 28, the Square D Company, Detroit, purchased the Kollsman Instrument Company for about $4,000,000. Kollsman has specialized in equipment for the aviation industry but Square D sees a big future for aviation and senses possibilities for the application of Kollsman's ideas and apparatus in general industry also.

At present Kollsman's manufacturing will remain at the Kollsman plant in Elmhurst, N. Y. Paul Kollsman remains with Square D at least three years as a consultant and has a ten year obligation to offer Square D an option to purchase new inventions.

•

Graybar Promotions

Graybar Electric Company, New York, has announced the following changes in personnel—

W. A. Moorefield has been made Branch House Manager at Winston-Salem and Harry A. Cobaugh Branch House Manager at Newark.

C. S. Powell has been put in charge of the Boston District, which includes the branch houses of Providence, Worcester, and Springfield, Mass. He will make his headquarters in Boston.

S. L. Cook has been appointed manager of the Nashville branch.

E. F. Murphy, now assistant sales manager of the New York District Office, becomes Eastern Commercial Sales Manager. He will make his headquarters at the New York District office at 180 Varick Street.

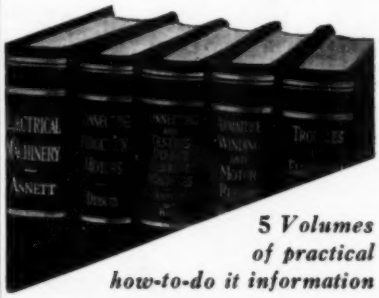
•

Westinghouse Supply Changes

R. G. Berke, manager of the Southwestern district of the Westinghouse Electric Supply Company, Dallas, Tex., announced several personnel changes in his district.

W. G. Sterett, formerly manager of the San Antonio Branch has been promoted to the position of manager of the Apparatus & Supply Departments of the Southwestern District.

Every phase of electrical maintenance and repair work covered in this NEW Library



5 Volumes of practical how-to-do it information

Every man concerned with the care and repair of electrical machinery should have these practical books, with their helpful tables, diagrams, data, methods and kinks. Every one of the five volumes is jammed to the covers with sound, how-to-do-it information—the kind you have to have when anything goes wrong. Liberal use has been made of practical data and practice in repair shops so as to combine the good features of a library of methods with handbook information covering these methods.

Electrical Maintenance and Repair Library

2042 pages, 1721 illustrations and diagrams

These books show you how to

—install all types of motor and generator units;
—locate breaks in armature windings and do a workmanlike job of rewinding;
—know just what is wrong with an electrical machine and take charge of installation and maintenance work;
—making accurate tests of switchboards and apparatus and correctly balance the power with the load;
—handle every sort of wiring job;
—show competence, whether it be in the use of a Stillson wrench or a Wheatstone bridge.

New trouble-shooting book

Now, in addition to four well-known practical books on all details of testing, connecting, rewinding, installing and maintaining electrical machinery, the Library includes Stafford's *Troubles of Electrical Equipment*, a new book full of helpful maintenance information, special trouble-shooting charts, explanation of symptoms and causes of machinery troubles, specific remedies, etc. This revised library gives you the ability to handle bigger jobs with surety of results.

10 days' examination
Easy monthly payments

We want you to examine this Library for 10 days. If you don't want them at the end of that time, there's no obligation to keep them. On the other hand if you decide you want the help these books can give, start the small monthly payments then, and in a short time the books are yours, right while you have been using them. Send the coupon today.

EXAMINATION COUPON

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Send me Electrical Maintenance and Repair Library, 5 volumes, for 10 days' examination. If I find the books satisfactory, I will send you $1.00 in 10 days, and $2.00 a month until $15.00 has been paid. Otherwise I will return the books postpaid.

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(Books sent on approval in U. S. and Canada only.)

For Wiring Jobs

PANTHER & DRAGON TAPES

because:

1. ***First to be Wrapped and SEALED in Cellophane.***
2. ***Perfect Adhesiveness and Tensile Strength.***
3. ***Strong Distinctive Green Core.***
4. ***Colorful Attractive Boxes.***
5. ***A Company in the Insulation Business Since 1878.***

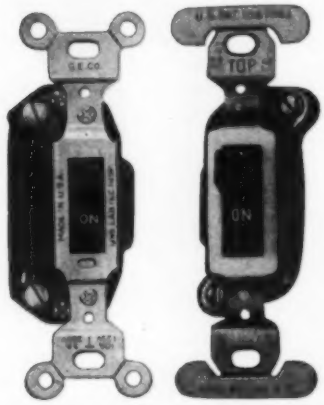
HAZARD INSULATED WIRE WORKS

DIVISION OF THE OKONITE CO.

WORKS: WILKES-BARRE, PENNSYLVANIA

New York Chicago Philadelphia Atlanta Dallas Washington Cleveland

Pittsburgh Buffalo Boston Detroit Seattle San Francisco St. Louis Los Angeles



G.E. OFFERS TWO LINES OF MODERN SWITCHES

Here are switches that will fill your everyday needs—designed for easy installation and long service. One line is composed of standard switches completely insulated with Textolite; the other is composed of silent, mercury Sphinx Switches. Single-pole, double-pole, 3-way and 4-way types are available in both lines with either brown or ivory handles.

"GET THEM IN PACKAGES"

These switches are available in sales-provoking packages of 50 G-E Standard Switches, 15 G-E Sphinx Switches and an action display to help you demonstrate and sell. Sales promotion material is also available.

For more information about these modern switches or about the switch package see the nearest G-E Merchandise Distributor or send in the following coupon.

MAIL THE COUPON

General Electric Company, Section D-0122
Appliance and Merchandise Department
Bridgeport, Conn.
Sirs: Please send me detailed information about G-E Sphinx Mercury Switches, G-E Standard Switches and the G-E Switch Package.

Name .....
Address .....
City ..... State .....

GENERAL ELECTRIC

In the News

[FROM PAGE 68]

Hal R. Edwards, who has been handling the company's business in Western Texas has been transferred to San Antonio, where he will take up the duties of branch manager.

E. C. Cummins, formerly office manager of the Fort Worth Branch, has been promoted to the position of branch manager, succeeding B. C. Coates, who has been transferred to West Texas to handle the company's business in that area.

•

Eagle Anniversary

Eagle Electric Manufacturing Co. of Brooklyn is celebrating its 20th Anniversary in the manufacture of electrical specialties. Beginning in 1920 making iron plugs by hand, they now occupy seven buildings producing wiring devices and specialties.

•

The Knox Porcelain Corporation of Knoxville, Tenn., has begun construction of another large factory building that will almost double present floor space.

•

The Clark Controller Company, Cleveland, announces that they will establish a direct branch sales office in Birmingham, Ala., effective the early part of this year. Harvey King will be in charge of this office and will cover Alabama, Tennessee and the Northern part of Mississippi.

•

Allen-Bradley Company, Milwaukee, has appointed L. M. Perkins manager of the air conditioning and refrigeration control division. Mr. Perkins was formerly with the Carrier Corporation. He will be in charge of product development and sales promotion.

•

Allis-Chalmers Mfg. Company has just completed a new addition to its transformer factory at Pittsburgh. It is to be known as the River Plant of the Pittsburgh Works.

•

Electro Manufacturing Co., Chicago, has instituted a new Commercial Fluorescent Engineering Service to assist its distributors in planning, figuring and designing the most efficient and modern fluorescent lighting available for all types of commercial installations. Bert K. Naster has been appointed chief engineer of this service.

Westinghouse Electric & Manufacturing Co. elected two new directors at a recent Board meeting. They are George A. Blackmore, president of the Westinghouse Air Brake Company of Pittsburgh and of the Union Switch and Signal Company of Swissvale, Pa., and Arthur W. Page, a vice-president and director of the American Telephone and Telegraph Company of New York and a director of the Continental Oil Co.

•

McKay Company, York, Pa., has appointed Joseph T. Ryerson & Son, Inc., of Chicago, as distributors of McKay Certified Stainless Steel Electrodes. These electrodes will be stocked by all the Ryerson branches, in Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia and Jersey City, as well as the central plant in Chicago.

•

Ward Leonard Electric Co. announces a change in the address of its representative, the Northwestern Agencies. The new office is located at 2411 First Avenue, Seattle, Wash.

•

Edison Storage Battery Division, Thomas A. Edison, Inc. has announced the appointment of Howard W. Teter as district manager of the Edison Storage Battery Supply Company, Boston. He succeeds P. F. Donovan, who resigned because of ill health.

•

Allis-Chalmers Mfg. Company has moved its Richmond, Virginia district office to the Richmond Trust Bldg.

Its Rockford, Illinois district office will hereafter be located in the Gas-Electric Bldg.

•

Illinois Electric Porcelain Co., Macomb, Ill., has appointed Ernest T. Loyd as its agent in the Southeastern section of the United States.

•

Revere Electric Company, Chicago, moved into its new plant on January 1. It is located on Paulina Street at Wellington Avenue, on Chicago's north side, and comprises a total area of four acres.

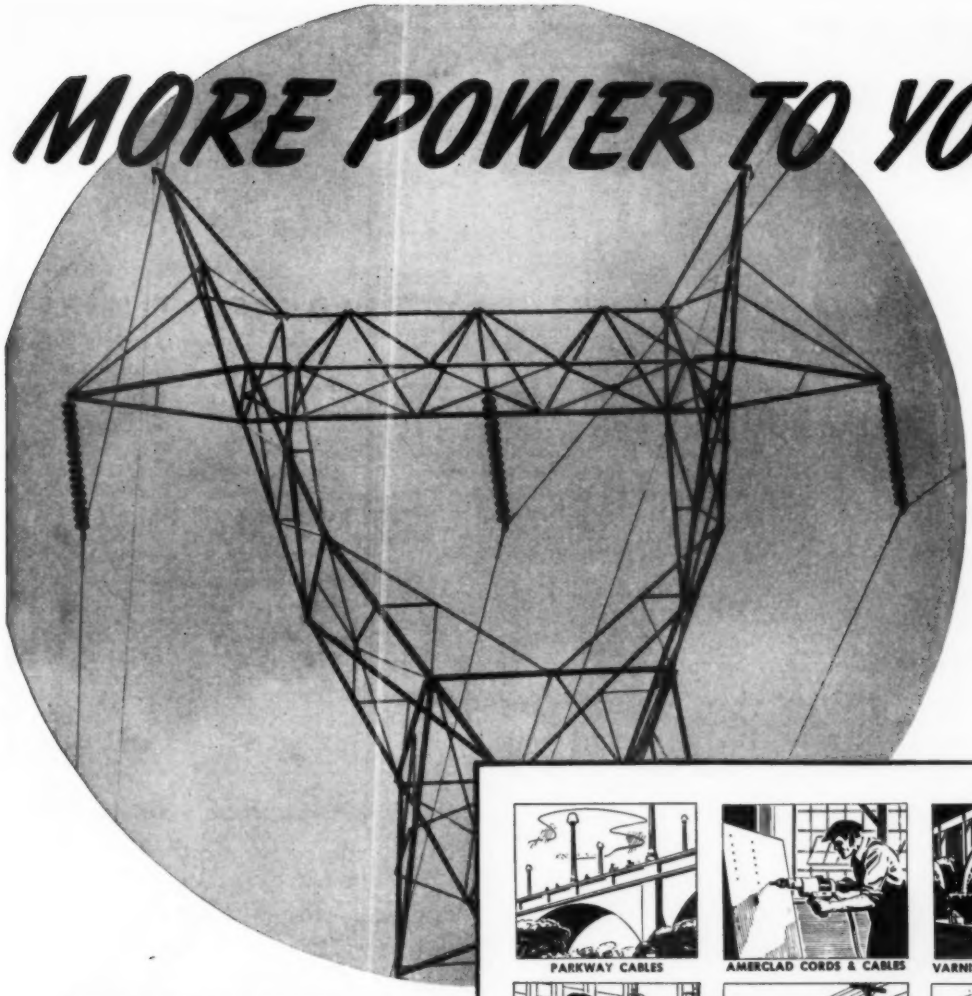
•

General Electric Company has appointed Robert A. Jones as district engineer of the New York district. W. S. Hill was named assistant district engineer.

•

Roller-Smith Co., Bethlehem, Pa. has announced the appointment of C. Swain Lumley as district engineer with headquarters at 53 W. Jackson Blvd., Chicago.

MORE POWER TO YOU!



TRACE the developments made in the electrical wire and cable field and you trace the history of the American Steel & Wire Company. For more than a century we have been developing new products, as well as improving and modernizing the old. During more than 100 years of wire making we have encountered innumerable problems in a field notable for progress and invention. In that period we have built up a background of experience that is always at your service.

ADEQUATE WIRING SERVES AND SAVES

AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago and New York

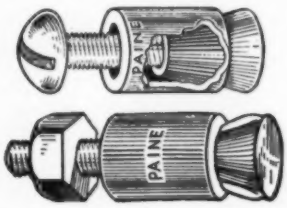
Columbia Steel Company, San Francisco, *Pacific Coast Distributors*

United States Steel Export Company, New York, *Export Distributors*

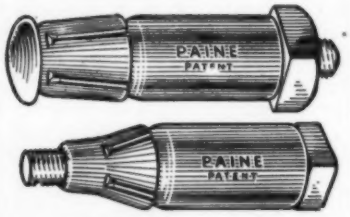
UNITED STATES STEEL

PAINE
ANCHORS
for Dependability

To insure dependable, permanently secure anchorage in all walls, floors or materials standardize on PAINE ANCHORS. Improved design built on extensive tests under all working conditions, give PAINE ANCHORS far greater holding strength—a wide safety factor you can rely on.



PAINE LEAD ANCHORS. These are the safest anchors for fragile materials, yet are equally effective in brick, stone, marble, etc. Their ease and simplicity of installation and permanent dependability save far more than the original cost. Embodying strong rustless cone and a specially developed lead-mix, they have by test as much as three times the holding strength of anchors of similar appearance.



PAINE STEEL EXPANSION ANCHORS fasten anything securely in concrete, brick, tile, slate, marble and stone.

Having the largest gripping area of any expansion anchor, they hold firmly to the hole walls making them equally effective in bottomless or exact depth holes. May be used repeatedly with same security by bending jaws back to original position.

Write for Complete PAINE Catalog TODAY!

PAINE
1912 ANCHORS HANGERS 1939
Superior Feature
BUILDERS SPECIALTIES

THE PAINE COMPANY
2961 Carroll Ave. Chicago, U.S.A.
Eastern Warehouse & Sales: 48 Warren St., N. Y.

More Gossip

Mahan A Director

Frank E. Mahan, president and treasurer of the Benson Electric Company, electrical contractors, of Superior, Wisconsin, has just been elected a director of the Superior Chamber of Commerce.

To Floodlight Polo Grounds

Harry Alexander, Inc., electrical contractors of New York and Washington will floodlight the New York Giants baseball field at the Polo Grounds.

When completed this will be the most powerful floodlighting system on any sports field in the world.

MOTOR MAN Roy Hyre, Hyre Electric Co., Chicago, retiring president of Central District Chapter, N.I.S.A. congratulates his successor Joe Ferrari, Excel Electric Service Co., Chicago at the first 1940 meeting of the organization on January 9.

Code Changes Indexed

To eliminate confusion and speed up enforcement of the new Chicago City Electrical Code, the first since 1931, Ray Ashley of the Chicago Electrical Contractor's Association made a thorough comparison of the two codes and indexed all important revisions. The Electrical Contractor's Association broadcast copies of the index throughout the electrical industry in the Chicago area.

Contractor Wins Award

The Blumenthal-Kahn Company, electrical contractors of Baltimore, won the award for excellence in craftsmanship, given each year by the Building Congress and Exchange of Baltimore. The prize-winning project was the lighting installation at the Hotel Emerson ballroom, designed by Crisp and Edmonds, architects.

TIME SWITCHES

TRIPLE POLE
DOUBLE POLE
SINGLE POLE

All three types can be furnished with capacities ranging from 20 TO 200 AMPERES PER POLE, listing from $16.50 up. Ten ampere Time Switches from $3.95 up.

PROCESS TIMERS

INTERVAL TIMERS, or PROCESS TIMERS, are furnished in two types. One is reset by hand (manual); other resets itself, automatically. Both types can be provided for practically any cycle of time, fully adjustable from zero to maximum period. SYNCHRONOUS, SELF-STARTING MOTORS.

SIGNAL TIMERS

Used extensively for starting and stopping industrial work; school class periods; for municipal time signals, etc. Up to six signal periods, permanently set at factory with Sunday & Holiday Cutout and Manual Control, at a list price of only $35.

Write for Information

AUTOMATIC ELECTRIC MFG. CO.
MANKATO, MINNESOTA

WOLVERINE SOLDERING LUGS

- *High-Conductivity*
- *Square-End*
- *Uniform Dimensions*

BUY FROM YOUR JOBBER

WOLVERINE TUBE CO.
DETROIT, MICHIGAN

Shop Man Shows Movies

Edward Kotz of the Electric Motor and Repair Company, Trenton, N. J., is busy these days producing his own technical movies and providing entertainment for the Engineer's Club. Ed has a movie of a complete motor rewind job in his shop which he shows to the technical students in the local schools.

Dramatizing Glass Insulation

At a recent electrical show in Chicago, the Sievert Electric Co., Chicago motor shop used a trick display to show-off the heat resisting quality of glass insulated wire.

A coil of glass insulated wire was suspended above an open flame. To add a touch of mystery to the exhibit the coil was connected to a 25 watt lamp which remained lighted. The energy was provided by induction from another coil concealed in the table below the display.

ENTERPRISING CONTRACTORS—Herbert G. Martin, Inc., electrical contractors of Yonkers, N. Y., do everything from house wiring to aqueduct work, and they go all the way to Hawaii, Puerto Rico, and Venezuela to figure jobs. John O'Brien, estimator (left) and Herbert G. Martin, president, are here consulting a progress chart on the Mulford Housing Project, Yonkers, for which they have the contract.

Business Card Stays Alive

Walter J. Rider, electrical contractor and motor shop man of Binghamton, N. Y. makes sure his business cards keep working for him.

On the back of his cards he prints the formulae for determining amperes, horsepower, kilowatts and kilovolt-amperes for the various systems. The card affords a handy reference and so is carried in note books or vest pockets.

Contractors In Municipal Union

George C. Miller, retired head of the old Jarvis Electric Co. and former mayor of Vancouver, and Fred J. Hume, mayor of New Westminster, B. C., and head of Hume and Rumble, electrical contractors, have been elected first and second vice-presidents of the Union of British Columbia Municipalities.

COMPLETE LIGHT-UNITS OF FLUORESCENT AT ITS FINEST

ready to modernize your lighting-now!

HYGRADE MIRALUMES —a sensational new opportunity for sales-and-profit gains!

INSTALL—AND TURN ON DAYLIGHT!
THESE DIAGRAMS SHOW THE DIFFERENCE
53% COOLER for a given light output than old-type lighting.
It's a real revolution in lighting.
11 TIMES the luminous surface — several times more light-per-watt!

HYGRADE MIRALUME—HF-200—200-watt unit—complete with four 40-watt, 48" Hygrade Fluorescent lamps—approx. length, 50".

ALSO *for industrial use:* HYGRADE MIRALUME—HF-100—100-watt unit—complete with reflector and two 40-watt Hygrade Fluorescent lamps—approx. length, 57".

NEW THOUSANDS BEING INSTALLED EVERY WEEK!

High levels of illumination...without harsh glare or shadow...several times the light per watt...53% less heat for equal light! MIRALUMES—for every industrial or commercial use—are ready *now.* Corrected for power factor and stroboscopic effect (flicker)...starters easily accessible...completely engineered by HYGRADE. *Mail coupon now—to learn about this sensational new sales-and-profit field!*

Copr. 1940, Hygrade Sylvania Corp.

LOW COST · Hygrade · FULL LIFE · MORE LIGHT

FLUORESCENT AT ITS FINEST

Hygrade Fluorescent Lamps

MAIL COUPON TONIGHT!

Hygrade Sylvania Corp., Salem, Mass.
I am interested in Hygrade Fluorescent MiralumeUnits–HF-100,HF-200
I want prices, discounts, full information.

Company_____
Individual_____
Address_____
City and State_____

EC-2

Keep Up-To-Date on new developments

through this FREE SERVICE . . . . . .

Electrical Contracting brings you the latest literature of leading manufacturers without cost or obligation

APARTMENT TELEPHONE SYSTEMS

1. Catalog containing 36 pages of data on complete range of equipment for apartment house telephone systems. Wiring diagrams and specifications are also included. Connecticut Telephone & Electric Corp.

CAPACITORS

2. Bulletin describing motor starting capacitors. Details on 1⅜-in., 2-in. and 2½-in. round can, square metal box with lugs and 220 volt a.c. round and square can. Dumont Electric Co., Inc.

RECTIFIER

3. Bulletin No. B-6064, illustrating and describing mercury arc rectifiers for power conversion. Also data on multi-anode rectifiers and Excitron single-anode rectifiers. Allis-Chalmers Mfg. Co.

TIME SWITCHES

4. Catalog No. 1000, contains a detailed description of synchronous motor, synchronous motor with carry-over and electrically wound time-switches. Sangamo Electric Company

BRONZE BEARINGS

5. Catalog L-2 consisting of 22 pages of detailed information on Ledaloyl bearings and bushings. Johnson Bronze Co.

BUS DUCT

6. Bulletin 394, illustrating and describing the plug-in busbar system of distribution. Bull Dog Electric Products Co.

SIGNAL SYSTEMS

7. A folder illustrating phones and switchboards for use on intercommunicating and other types of private telephone systems. S. H. Couch Company, Inc.

CAPACITORS

8. A 16-page folder giving data on industrial capacitors for use and replacement in electrical refrigerators, oil burners and other motor-driven equipment. Aerovox Corp.

WELDING TABLES

9. Bulletin No. 160, shows many uses for the new revolving tilting welding table. Many illustrations are given. Ransome Concrete Machinery Co.

DRILL CHART

10. A chart showing the correct size of Carboloy masonry drill to use for 36 makes of expansion anchors and shields of various sizes. Carboloy Company, Inc.

INSTRUMENTS

11. Folder GEA1758B, illustrating and describing a complete line of rectangular switchboard instruments. General Electric Co.

PIPE THREADING MACHINE

12. Bulletin B, outlining the Model-B portable ⅛ to 2-inch pipe and bolt machine. Beaver Pipe Tools

GENERATORS

13. Bulletin B-6031, featuring alternating current bracket bearing generators. Illustrates and describes construction, application and operation. Allis-Chalmers Manufacturing Co.

CABLE DIGEST

14. Bulletin GEA-3280, entitled "Cable Digest" is a condensed guide to aid in selection of insulated cable for low-voltage power circuits. General Electric Co.

PUSHBUTTONS

15. Descriptive Data 15-020, covering new line of standard duty pushbuttons for a.c. and d.c. pilot circuits. Westinghouse Electric & Manufacturing Co.

CAPACITOR

16. Catalog No. 162, on replacement motor starting capacitors for electric refrigerators, oil burners and other motor driven equipment. Cornell-Dubilier Electric Corp.

ELECTRODES

17. A 24-page catalog containing 1939 joint tentative specifications for iron and steel arc-welding electrodes of American Welding Society and American Society for Testing Materials. The McKay Co.

FLUORESCENT LIGHTING UNIT

18. Bulletin No. 62, illustrates and describes the "Day-Flo" fluorescent lighting unit, a two lamp unit, designed for general illumination of industrial areas. Wheeler Reflector Co.

LIGHTING EQUIPMENT

19. Catalog No. 40, illustrating and describing adjustable electric brackets, portables, reflectors and metal shades, therapeutic lamps and also electric fixtures and fittings. Faries Manufacturing Co.

TIME METERS

20. Bulletin F-1, featuring synchronous motor driven running time meters. Gives application, construction, features, uses and many illustrations. R. W. Cramer Co.

HOISTS

21. Catalog No. G-1, with 20 pages of data on trolleys, spur gear chain hoists, maintenance tools, differential chain hoists, ratchet lever hoists, spur gear gravity hoists, electric hoists and load binders. Coffing Hoist Co.

LATHES

22. Catalog No. 50, featuring 9-inch "Workshop" precision lathes. Many illustrations are shown. South Bend Lathe Works.

PUMPS

23. Bulletin No. 115B, describing and illustrating self priming super turbines, and straight-self priming centrifugals for semi-industrial applications. Decatur Pump Co.

SWITCH BOXES

24. Price list No. SB-1239, on switch boxes for armored cable, non-metallic cable, flexible non-metallic tubing, conduit. Also extended ear boxes, receptacle boxes, bracket switch box. All-Steel-Equip Co.

(Continued on page 76)

"As different as day and night"

FLUORESCENT LUMINAIRES

Supplementary Industrial Lighting for work benches or machines alone is never recommended. However, during a lighting modernization program, general illumination in the Cleveland Apex Electric Company Plant was turned off to show the remarkable illumination characteristics of the Westinghouse Type FA Fluorescent Luminaires on the left. Illumination values averaged 4½ times higher than the Incandescent units on the right, yet wattage consumption increased only twice.

Industries everywhere are awakened to the advantages of Fluorescent lighting for general or supplementary illumination in low-bay areas. These new type luminaires, easy to install and maintain, provide cooler light, less glare, softened shadows and higher efficiency.

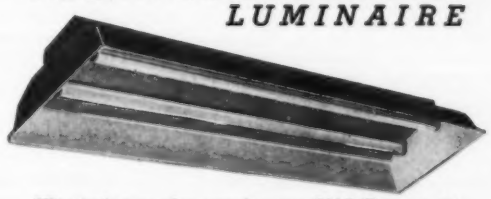
When used with "daylight" Fluorescent lamps, Westinghouse FA Luminaires give a close approximation of standard artificial daylight. Units have an individual, Alzak-processed, specular reflector for each lamp. Contours provide maximum light output with cutoff 65° from vertical when viewed normal to the lamp.

Scientifically engineered, Westinghouse Fluorescent Luminaires have twin ballast units and compensators, which provide high power factor of 95-99%, minimized cycle flicker, and assure satisfactory lamp performance.

Concentrating and spread-type units with one or two lamps are available in 20-watt, 30-watt and 40-watt sizes.

Westinghouse Luminaires will create satisfied customers and new profits for you. Call your nearest Westinghouse Jobber, or write Westinghouse Electric & Mfg. Co., Lighting Division, Edgewater Park, Cleveland, O.

RLM FLUORESCENT LUMINAIRE



Westinghouse also supplies an RLM Fluorescent Luminaire built to the Specifications of the RLM Standards Institute. This unit is designed with a porcelain-enameled steel reflector.

Westinghouse Supplies a Complete Line of Incandescent, High Intensity Mercury and Fluorescent Industrial Luminaires

Westinghouse Lighting Equipment

WELDER

25. Bulletin No. 308, outlining 200 ampere "Shield-Arc Junior" welder with self-indicating dual continuous control. Lincoln Electric Co.

LIGHTING UNIT

26. A folder entitled "Daylight—When and Where you Want It". It describes the fluorescent "Miralume" HF-100 unit. Hygrade Sylvania Corp.

FLUORESCENT FIXTURE

27. Bulletin F-18 describes and illustrates the "Two-Forty" fluorescent general lighting fixture for industrial applications. Day-Brite Lighting, Inc.

WIRING DEVICES

28. Catalog No. 27, consisting of 88 pages of data and illustrations on the Arrow line of wiring devices. Also a 24 page price list and index. Arrow Electric Division, Arrow-Hart & Hegeman Electric Co.

CAPACITORS

29. Publication GEA-3225 describes power-factor and its improvement with G-E pyranol capacitors. General Electric Co.

FLUORESCENT FIXTURE

30. A folder illustrating and describing "Miralume" HF-200, a unit package of fluorescent daylight for every high-level lighting use. Hygrade Sylvania Corp.

WELDER

31. Bulletin No. B6049 features the "Weld-O-Tron", a new low current electronic welder for precision work. Allis-Chalmers Manufacturing Co.

REGULATORS

32. Bulletin GB-234 illustrating and describing automatic generator voltage regulators. Schematic drawing and connection diagrams, mounting dimensions and charts are included. Burlington Instrument Corp.

WIRING DEVICES

33. Catalog "A" contains switches, outlet boxes, receptacles, plates. Illustrations, data and price list are given. Marks Products Co., Inc.

AUXILIARIES

34. Folder GEA-3293 featuring a new design of auxiliaries for fluorescent Mazda lamps. Illustrations, outline dimensions and wiring diagrams are given. General Electric Co.

WIRING DEVICES

35. Catalog "X", illustrating and describing complete line of wiring devices. Consists of 88 pages with 24 page price list and index. Hart & Hegeman Division, Arrow-Hart & Hegeman Electric Co.

TOOLS

36. Catalog No. A-39, consisting of 15 pages of features and specifications on grinders, sanders, buffers, motors, rotors and stators. Sawyer Electrical Manufacturing Co.

MOTORS

37. Folder 938A, outlining repulsion start induction brush lifting single phase motors. Many illustrations. Century Electric Co.

CONDUIT & TUBING

38. Folder illustrating and describing "Century" asbestos-cement cable conduit and tubing. It is fireproof and non-corrosive. Keasbey & Mattison Co.

PUMP

39. Catalog Bulletin No. 104D, featuring condensation return units. Consists of 20 pages of data and illustrations. Decatur Pump Co.

REGULATORS

40. Bulletin GEA-21508, illustrating and describing diactor generator-voltage regulators, Type GDD for d.c. machines. General Electric Co.

LIGHTING EQUIPMENT

41. Catalog 35, containing sections on indirect luminaries; direct-indirects; recessed and surface units; industrial reflectors; fluorescent Fluoflectors; Edwin F. Guth Company

WIRE ROPE CLAMP

42. Folder featuring Safe-Line wire rope clamp. Description, illustrations and price list given. National Production Co.

TIME SWITCHES

43. Folder GEA-3339, outlining time switches, Type T-27 for general purpose automatic time switch. General Electric Co.

MOTORS

44. Four-page folder X-3558, picturing and describing complete line of stock motors, 5 hp. and smaller. Emerson Electric Mfg. Co.

CONDENSERS

45. Bulletin No. 9424, covering disc-flow, counter-current type barometric condensers. Covers description, advantages, diagrams showing operation, specifications, auxiliary equipment. Ingersoll-Rand Co.

OIL CIRCUIT BREAKERS

46. Leaflet B6023, illustrates and describes type D-20 and KD-20 switchboard type oil circuit breakers with three poles in one tank, capable of wide application to industrial service. Allis-Chalmers Mfg. Co.

LATHES

47. Catalog 100, consisting of 112 pages of illustrations and description of floor leg lathes, bench lathes, metric lathes, attachments, features and specifications. South Bend Lathe Works.

STOKER MOTORS

48. Booklet F-8489, featuring Thermoguard protection against improper operating conditions of stoker motors. Illustrations are given. Westinghouse Electric & Mfg. Co.

ELECTRIC TOOLS

49. A 62-page catalog on portable electric tools. Descriptions, illustrations and price list are given. Black & Decker Mfg. Co.

SWITCHGEAR

50. Catalog 8-b, illustrating and describing moderate duty, vertical lift, metal-clad switchgear for indoor service. Roller-Smith Co.

Circle numbers, sign and paste on a penny postcard or mail in an envelope.

ELECTRICAL CONTRACTING **February**
330 West 42d St.
New York, N. Y. **(Not good after April 1)**

Please send me without obligation, manufacturers' literature herein described and identified by numbers circled below.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61														

NAME..... TITLE.....

COMPANY .....

ADDRESS .....

CITY..... STATE.....

MOTORS

51. Leaflet F-8491, describes heavy duty motors of ⅛ to ½ hp. for blowers, air compressors, small machine tools, industrial vacuum cleaners. Westinghouse Electric & Mfg. Co.

INSTRUMENT

52. Catalog No. 168A, covering new "Test-Mike" and "Service-Mike" for a.c. motor starting capacitor service tests. Included are connection diagrams and a diagram of switch positions. Cornell-Dubilier Electric Corp.

INDUSTRIAL CONDENSER MANUAL

53. This industrial capacitor manual has information on motor-starting capacitators, including diagrams, curves, specifications, formulae and tables. Aerovox Corp.

MOTORS

54. Leaflet S-8486 describes and gives ratings of oil burner motors with thermoguard protection feature. Westinghouse Electric & Mfg. Co.

TRANSFORMERS

55. Bulletin B6043 outlines savings which can be obtained by the Chlorextol filled transformers. Suitable for installation in locations which will require a fireproof vault. Allis-Chalmers Mfg. Co.

INSTRUMENTS

56. Bulletin GEA-17848, covering portable instruments for a.c. and d.c. Available as voltmeters, ammeters, milliammeters, wattmeters, volt-wattmeters. General Electric Co.

TERMINALS

57. Bulletin illustrating and describing streamlined gasketless type SS terminals, for outdoor and indoor use. General Cable Corp.

RELAYS

58. Bulletin GEA-2009A featuring directional ground relays, Types ICC and ICP, for ground-fault protection of lines. General Electric Co.

INSULATING COMPOUND

59. Bulletin describing Insolozite insulating compound for filling impregnated paper-insulated lead-covered cable joints; terminals; junction boxes, transformer bushings and other similar applications. General Cable Corp.

CHIMES

60. A folder illustrating and describing this line of door chimes. Detailed data and prices are given. Devalera Chimes.

TRANSFORMERS

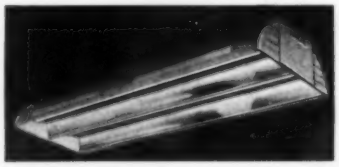
61. Bulletin TU-1A consists of 8 pages of information on rural-line transformers. Besides illustrations and descriptions, it contains connection diagrams, information on care and operation. Wagner Electric Corp.

Connect with Burndy in tight Spots
When you come up against tight spots in making connections there is no use beefing . . . the job must be done. Why not make the job easier by selecting Burndy Connectors. The type QPR shown here is only one of the many Burndy Connectors designed to reduce inconvenience where connectors are difficult to install.
BURNDY
BURNDY Guttertap
SEE YOUR WHOLESALER FOR DETAILS ON THIS ITEM

EQUIPMENT NEWS

Twin Lamp Fluorescent Unit

A new twin lamp fluorescent unit designed for high intensity local lighting use, or general lighting. Unit utilizes polished semi-concentrating Alzak aluminum reflector which produces from 100 to 150 footcandles when mounted three to four feet above working plane. It incorporates, under one housing, individual reflectors for each lamp, sockets with thermal glow-switch starters, and "Tulamp" ballast units. It is hinged to housing for easy maintenance. Suspension either by chain or rigid conduit. Benjamin Electric Manufacturing Co., Des Plaines, Ill.

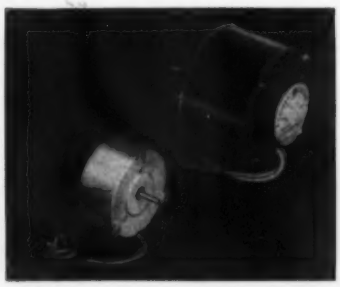


BENJAMIN FLUR-O-LITER UNIT

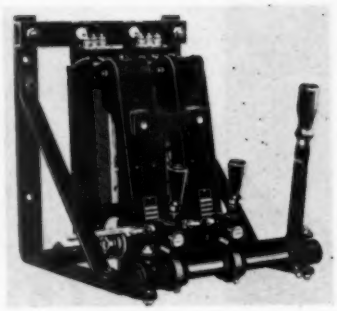
■

Motor

A new line of a.c. fractional horsepower motors has been developed for use on indicating and recording instruments, small regulating or control devices, remote control devices and similar applications. Built in two-frame sizes. In larger frame size, one motor delivers 40 oz inches torque at 75 rpm and other delivers 75 oz inches at same speed. In smaller size, four motors are available. All motors are of permanent split-capacitor type with separately mounted Pyranol capacitor. New Motors are inductor alternators operated as motors with an Alnico permanent magnetic field replacing usual d.c. excited field. General Electric Co., Schenectady, N. Y.



G. E. MOTOR



WARD LEONARD DIMMER

Dimmer

The Autrastat dimmer is an improved device for controlling lamp brilliancy. It has the characteristics of an auto-transformer with an infinite number of steps. Will control any load from 10-watt lamp up to maximum rating of dimmer. At any dimmer position, connected load may be increased or decreased without affecting intensity. Available in 3 sizes; 4,000, 5,000 and 6,000 watts maximum capacity and for use on 110–120 volt, 50–60 cycle a.c. Can be assembled in any of the forms of angle iron framework and provided with such control features as are available for Vitrohm resistance dimmers. Ward Leonard Electric Co., Mount Vernon, N. Y.

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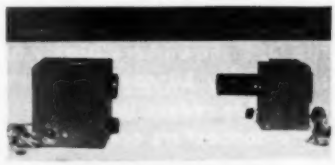
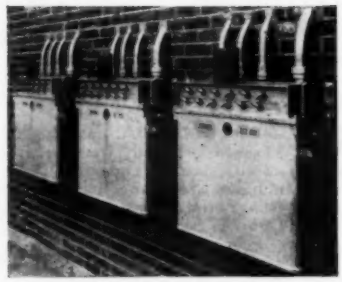


TELETOUCH ELECTRIC EYE

Electric Eye

Casts an invisible beam of light up to 35 feet. When beam is intercepted, the device sounds an alarm or throws a switch. Consists of a 3" x 4" x 5" light source unit and a 6" x 6" x 6" photo-cell unit. Used for burglar, fire and signal alarms; counting, opening and closing doors, operating safety devices on machinery. Teletouch Industries, Inc., 37 West 54th St., New York, N. Y.



WESTINGHOUSE OIL-IMMERSED PANEL

Oil-immersed Panels

A new oil-immersed panelboard, using thermal trip circuit breakers, for corrosive, explosive and hazardous locations. Breaker frame chamber has a compensating bimetal, affected only by the temperature of the oil in the tank. This neutralizes deflection of the tripping bimetal due to oil temperature, so that tripping bimetal is responsive only to load current. The compensated breaker permits zero to ten per cent decrease in rating, when oil is 140 degrees F., and the same range of increase when oil is 10 degrees F. Deviation is zero at 75 degrees F. Westinghouse Electric Mfg. Co., East Pittsburgh, Pa.

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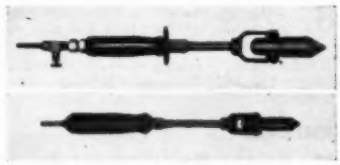


PREST-O-LITE SOLDERING IRON

Soldering Irons

Two new soldering irons of open flame type for use with air-acetylene flame. Flame is integral part of the iron, hence iron will not cool off and increased operating speed and economy result. Both sizes furnished with pointed-type coppers. Chisel-type coppers for small and chisel- and hatchet-type for large iron are also available. Standard iron can be supplied with needle valve in the handle, making iron suitable for outdoor work in cold weather. The Linde Air Products Co., 30 East 42nd St., New York, N. Y.

■

Fire Alarm Wire

A new heat-sensitive cable which is wired as a switch circuit. Automatically makes firm contact between the two conductors when affected by specific degree of heat, and actuates a relay. Comes in two ratings for 160 degrees F. and 220 degrees F. Standard color is red, but 160 degree cable furnished in brown or white. Normally for open circuit use but may be used for closed circuit work with suitable relays and resistances. The Protectowire Co., Hanover, Mass.

UMI

THAT'S THE G-E FAN STORY FOR 1940

IT'S a simple story too—a fine, dependable product backed by a name respected by both dealer and user.

And when you have that combination it's easily translated into profits.

Put yourself in line for these profits. Get the full story from your nearest G-E Fan distributor—but get it fast if you want to be in on the 1940 program.

And here's a good tip—make certain your distributor's salesman takes the wraps off the G-E 1940 Fan Portfolio the very next time you see him. We've called it "A Sweet Set-up!" . . . . . and it is!

And there's a plus you can't ignore—the dominant, colorful, National magazine advertising which month in and month out helps maintain user acceptance and keep the G-E name constantly in the limelight!

Help yourself to sales with this powerful promotion! Free with your initial G-E Fan order.

1. A full-color "stopper" display designed to catch the eye—and hold it!
2. Smart catalogs full of selling facts!
3. Direct-mail pieces to help build your volume!
4. Convincing ready-made newspaper mats for local use!
5. Powerful national newspaper ads in over 175 key cities—run at the best time to sell fans—in local hot weather!

G-E Fans are Going Places — Doing Things in 1940!

Fan Sales Section, Appliance and Merchandise Department, General Electric Co., Bridgeport, Conn.

GENERAL ELECTRIC

THE IDEAL FIXTURE FOR PROFIT-WISE MERCHANTS WHICH PROVIDES BETTER INDIRECT ILLUMINATION *plus* DIRECT DOWN-LIGHTING

• Here is a brand new Art Metal lighting creation which contractors can recommend for any commercial installation where modern appearance, indirect lighting and strong direct illumination are all equally important considerations. Typical of Art Metal's better engineering, the "Lenslier" makes use of the "Widelite" lens by Corning Glass, which uniquely provides a total 90° spread of light downward for ideal illumination of merchandise areas, counters, and display tables. Let us send you details of this outstanding addition to the *Art Metal line of fixtures for every type of installation.*

THREE MORE
NEW ART METAL
LIGHTING CREATIONS
FOR STORES, OFFICES, ETC.
Send for descriptive literature

THE
ART METAL
COMPANY
CLEVELAND · · · · OHIO

EQUIPMENT NEWS

[FROM PAGE 78]

Fluorescent Strip

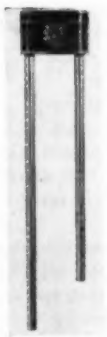
A new continuous strip lighting unit for use with single fluorescent lamp. It has a louvered bottom to eliminate lamp glare without reducing light output. Unit may be mounted end to end using sections from 18 to 48 inches in length. May be used in single or multiple rows, angles or geometrical designs. Efcolite Corporation, Trenton, N. J.

EFCOLITE LIGHTING STRIP

Switches & Covers

Enclosed Bakelite base switches of the residential type are now available, assembled to 3¼-in. and 4-in. metal outlet box covers. Switch frame is welded to cover. Made in both single pole and three-way styles with both sizes of cover. Switch base is 1-in. deep, 1¼-in. long and ½-in. wide. Arrow-Hart & Hegeman Electric Co., Hartford, Conn.

A-H. & H. SWITCH & COVER



DEVALERA CHIME

Electric Chimes

A series of electric door chimes for small and large homes, apartments, institutions and clubs. Available with two, three, four and five tubes and in several different models with various finishes and artistic decorations. Most models have two notes for front and one note for rear door. Others available up to thirty signal combinations. Chimes operate on 12-16 volts, 40-60 cycles a.c. or 3 to 6 volts d.c. Furnished complete with transformer. Devalera, Electrical Acoustic Division, 1945 Park Ave., New York, N. Y.

Make those appliances

QUIET!

● When you sell or install electric appliances of the radio-noise-producing kind—electric razors, oil burners, motor-driven appliances, etc.—be sure you silence them for your radio-minded customers.

It's easy. Simply select the right one of the several available AEROVOX noise eliminators. Plugs in between interference-producing appliance and outlet. Our literature tells which type to use.

And for very best results, use the AEROVOX Interference Analyzer. Instantly indicates best type for given application and how to connect. This invaluable instrument costs only $7.00 net.

Ask Your Jobber . . .

Local AEROVOX jobber will gladly show you the analyzer and the noise eliminators. Also ask for copy of our 1940 catalog —or write direct.

AEROVOX
NEW BEDFORD, MASS.

SEE FOR YOURSELF

How wires are wedged fast—gripped *completely around* in the V-BOTTOM wire opening of

SOLDERLESS LUGS

Learn how fast you can make strong, neat solderless connections . . . with just your wrench, screw driver or pliers.

SEE ONE IN ACTION!

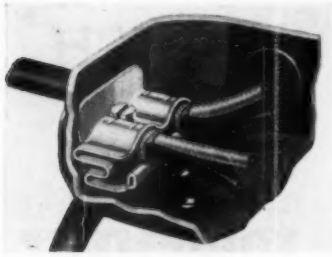
Write for Free sample—or better still, ask your Electrical Jobber for one.

DEPT. E C

Ilsco Copper Tube & Products, Inc.
5629 Madison Road, Cincinnati, Ohio

Cable Clamp

This new cable clamp is for use with non-metallic cable for switch and outlet boxes and permits side or bottom entrance of cable or both. It bushes cable sheath from edge of knockout; accommodates wide range of cable sizes. Clamp is held clear of knockout until ready for use. All-Steel-Equip Co., Inc., Aurora, Ill.



RACO CABLE CLAMP

■

Wiring Devices

A new line of "Speed" wiring devices for use in flush and surface outlets. Includes toggle and push button switches and duplex receptacles rated at 10 amperes, 125-volts, 5 amperes, 250-volts, radio and power duplex outlet rated at 15 amperes, 125-volts, 10 amperes, 250-volts. Available in brown or ivory with full line of single gang and combination wall plates. Marks Products Co., Inc., 84-90 North 9th St., Brooklyn, N. Y.

MARKS FUSH TOGGLE SWITCH

■

Apartment Telephone

A new apartment house telephone with a pilot light that tells the tenant when the caller has opened the vestibule door. Tenant, upon receiving the caller's signal from the vestibule, clicks door opener until pilot light flashes, showing that caller has opened the entrance door. Connecticut Telephone & Electric Corp., Meriden, Conn.

CONNECTICUT TELEPHONE

NOW! Porto-Power

BENDS 7 SIZES OF PIPE

WITH ONE PORTABLE UNIT

NEW S-36 shown bending 4" pipe. Speedy 20-ton ram action controlled from hand-operated pump.

New **S-36**

SUPER-RANGE BENDER HANDLES *up to* 4"

Contractors have asked for a Porto-Power Bender to handle up to 4" pipe. Blackhawk DOES MORE than meet this demand... New S-36 is loaded with refinements... bends SEVEN sizes of rigid conduit and pipe: 1¼", 1½", 2", 2½", 3", 3½" and 4" diameters!

Here are just a few of the BIG FEATURES:

NO JACK KNIFING — No loose extension bars, tension arms and ram collars . . . the bending frame is ONE sturdy unit.

SPEEDY SET-UP — New "Pull-Pins" eliminate bolts, nuts and monkey wrenches.

LIGHT WEIGHT — Bending frame and ram, with 4" set-up, weighs only 128½ lbs.

ROLL TO THE JOB—Pilot shoes also serve as wheels for rolling bender along floor.

POWERFUL HYDRAULIC UNIT — 20-ton all-directional ram coupled with high-pressure swivelled hose and hand operated pump (Ram also used with special attachments for pulling pulleys, gears, etc., and for wide range of heavy lift, press and push jobs).

Write today for Catalog and prices — Porto-Power will pay for itself on your next job!

A Product of **BLACKHAWK MFG. COMPANY**

DEPT. P2020 **MILWAUKEE, WISCONSIN**

BLACKHAWK

WORLD'S LARGEST MANUFACTURER OF HYDRAULIC JACKS

INSTALL

CONDUIT PRODUCTS

UNIFORM HIGH QUALITY

G-E Conduit Products will give dependable service indefinitely. They are easy to install. The line includes G-E White Rigid Conduit, G-E Flexible Conduit, G-E Electrical Metallic Tubing, G-E BX Armored Cable, G-E BraidX, G-E Service Entrance Cable, G-E Boxes and Fittings.

For further information see the nearest G-E Merchandise Distributor or write to Section C-0122, Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.

GENERAL ELECTRIC

EQUIPMENT NEWS

[FROM PAGE 81]

Fluorescent Fixture

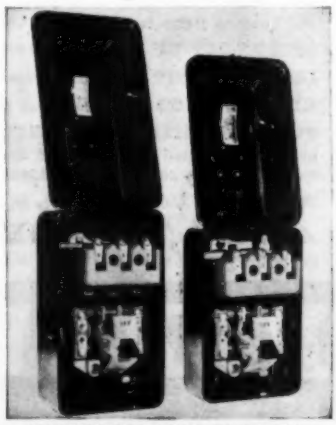
A new streamlined fluorescent fixture designed for general commercial use on 110/125-volt 60 cycle a.c. circuits, employs four 48-inch, 40-watt lamps. It is corrected for power factor and stroboscopic effect. Furnished completely wired with lamps, starters and auxiliaries. Total wattage including lamps and auxiliaries approximately 200 watts. Length 48¼-in., width 10½-in., height 7⅝-in. Furnished with 40-inch double-stem for mounting with single canopy. Can be supplied unwired. Hygrade Sylvania Corp., Salem, Mass.

HYGRADE MIRALUME

■

Motor Watchman

A new De-ion motor watchman, manually operated across-the-line starter for controlling grinding wheels, drill presses, fans, pumps, blowers, riveting and stapling machines. Positive indication of "on", "off" or "tripped" position is provided by an indicating toggle switch. Snap-action bi-metal disc gives automatic overload protection. It is trip-free. Has safety interlock, as cover may not be opened unless switch is in "off" position. Non-warping, non-carbonizing porcelain arc box and base for operation under high humidity conditions. Knockouts on top, sides, bottom or back of case. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



WESTINGHOUSE MOTOR WATCHMAN

COMING in MARCH

●

EQUIPMENT PROGRESS REVIEW ISSUE

ELECTRICAL CONTRACTING

●

A review of "What's New" in the electrical industry. Over 150 pages of valuable data that you will want to keep for regular use

MANUFACTURERS:

Closing Date for Advertising Copy

FEB. 20th

Electrical Connector

The T-connector has all corners and edges rounded and bolt heads are sunk in sockets to facilitate taping. This same general type of construction is also available for couplers, terminals, stud connectors and other shaped connectors for tube or cable. Burndy Engineering Co., Inc., 459 E. 133d Street, New York.

BURNDY ELECTRICAL CONNECTOR

■

Bus Duct

A movable and flexible duct enclosed busbar system, with "plug-in" openings every 12 inches, designed for use in factories, garages and repair shops and other places where the total load is small. The "125" BUS distribution duct comes in ten foot lengths, two and three pole, 600 volts and less. Each section has ten power taps. Provides flexibility for the small plant. Bull Dog Electric Products Co., Detroit, Michigan.

BULL DOG "125" BUS DUCT

■

Speed Motor

The Ajusto-Spede motor is a combination of an eddy current clutch and a standard constant speed a.c. squirrel cage motor. Speed and torque variations are obtained by controlling the magnetic excitation of the clutch. Some of the functions of this unit are gradual or quick acceleration of load, rapid intermittent starting and disconnecting load, absorbs tortional impulses and vibrations. Louis Allis Co., Milwaukee, Wis.

LOUIS ALLIS MOTOR

BUFFALO "L" BREEZO FAN

Exhaust Fans

A new propeller type exhaust fan for duct applications where desirable to have motor outside air stream path. Suitable for conditions where there is an excess of moisture, heat, dust, fumes. Designed so air inlet can be at top, bottom or either side. Available in 12 in. to 36 in. size with a free air delivery range of from 1080 to 10,800 cubic feet per minute. Motor sizes are ½ to ¾ hp., single- or three phase, 60 cycle a.c. or d.c. Buffalo Forge Company.

■

WAGNER RURAL-LINE TRANSFORMER

Transformer

A new rural-line distribution transformer re-designed to including following features; two sets of hanger brackets welded to tank 180° apart; "jump-proof" mounting slots; three low-voltage stud-type bushings of new design; two solderless ground lugs and accessible dial-type tap changer. Available 1½ to 15 kva. up to 7,620-volts. Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.

■

THOR ELECTRIC DRILL

Electric Drill

A new ¼-in. capacity light-duty portable electric drill designed for intermittent service. It is 15¼-in. overall and weighs 9¼ pounds. Streamlined for use in tight places. Has a powerful motor with air intake and extra heavy tooth pitch gears. Standard equipment includes fully enclosed dust proof double pole momentary switch in handle, spade handle, removable dead handle and spring clip retainer for chuck key, Independent Pneumatic Tool Co., Chicago, Ill.

■

WESTINGHOUSE SPOT LAMP

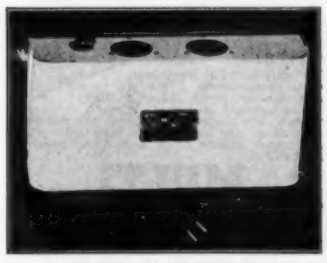
Spot Lamp

A 300-watt mazda reflector spot lamp for use in show-window or interior display spotlighting, as well as supplementary commercial and industrial lighting. It produces a maximum of 16,000 candlepower. The R-40 bulb, 5-inches in diameter, is used. Over-all length is 6½-inches. Lamp has medium screw base but is recommended for use only with porcelain sockets. May be burned in any position on 110-, 115- and 120-volt circuits. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

■

Electric Door Signal

A new photoelectric unit which contains a light source and gong. An adjustable mirror is attached on the opposite side of the door. A pencil of light from the unit strikes the mirror, is reflected back into the unit and rings the gong. Finished in ivory, 10" x 5" x 2". Standard for 115 volt a.c. circuits. Plugs into any outlet. Photobell Corp., 123 Liberty St., New York, N. Y.

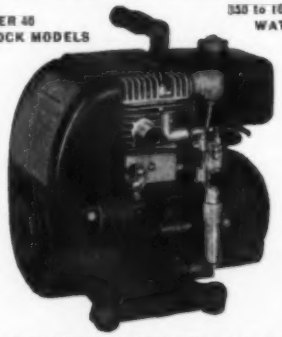


PHOTOBELL DOOR ATTENDANT

ONAN
ELECTRIC PLANTS

OVER 40 STOCK MODELS

350 to 10000 WATTS



ONAN ELECTRIC PLANTS satisfy both Owner and Dealer. Thousands of these **DEPENDABLE PLANTS** are operating **ALL OVER THE WORLD. ONAN PLANTS GO EVERYWHERE. COMPACT, HIGH QUALITY,** because they are built by one Organization specializing in their manufacture for over 14 years. They have proven their **ECONOMY** and **VALUE** to users and a **MONEY MAKER** to dealers.

Used in Homes, Farms, Schools, Churches, Theatres, Resorts, Radio Stations. Installed in Boats, Trucks, Trailers, even Airplanes. Supply LIGHT and POWER to operate Radio Transmitters, Receivers, Motors, Electric Tools. Serve as EMERGENCY POWER when Power Company lines fail.

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Reflectors
. . . . . GIVE YOU MORE INSTALLATION OPPORTUNITIES

GLASSTEEL DIFFUSERS

Ideal for correct light distribution in factories and plants. No danger of breakage from vibration and expansion because glass globe is held by a Multi "Gripit" holder with internal finger support. Made of Armco Ingot porcelain enameled white inside and out. Available in all standard types and sizes.

FLUORESCENT FIXTURES

This basic unit fits many individual requirements. Two or more can be joined where a high lighting intensity is desired. Where a sectional line fixture is wanted interchangeable end sections may be used with basic unit. Aluminum bronze outside finish and Alzac aluminum reflectors.

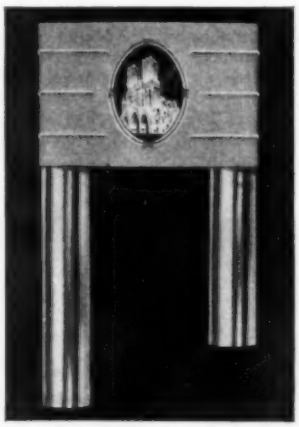
MULTI
ELECTRICAL MANUFACTURING CO.
1840 W. 14th ST., CHICAGO, ILL.

EQUIPMENT NEWS

[FROM PAGE 83]

Door Chime

A new short tube electric door chime for use in limited spaces. A sturdy well built mechanism is combined with pleasing appearance. Chime sounds two notes for front and a single note for rear door. Dimensions—12¼ inches wide, 7 inches high, 1¾ inches deep. Finish—ivory art. Furnished complete with transformer. Liberty Bell Manufacturing Co., Minerva, Ohio.



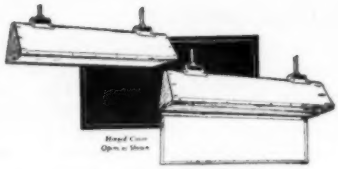
LIBERTY BELL CHIME

■

Downlites

A unit for illumination in lofty interiors where good light is desired at the floor and only reflected light on walls and ceiling. A concealed unit glare free from normal angles. Angular, horizontal baffle plates inside lower part of body traps all spill-light and eliminates brightness at or around aperture. Supplemental reflector or "shovel" gives lateral beam which lights an adjacent wall from floor to ceiling. Maximum beam spread 60 degrees. Uniform intensity within 45 degree conical beam. Rambusch Decorating Co., 2 West 45th St., New York, N. Y.

RAMBUSCH DOWNLITE



MILLER REFLECTOR

Flourescent Reflector

The Ivanhoe dust tight double tube fluorescent reflector is designed for lighting industrial areas where hazard exists. Has a low exterior surface temperature. Outer surface finished in chrome. Heat resisting herculite clear plate glass used in hinged cover. Inner reflecting surface of aluminum provides control of light. For lighting of limited areas, concentrating type should be used and the flood type where a broader coverage is desired. Ratings are 22-240 volt, 60 cycle auxiliary for 30-watt lamp. The Miller Co., Meriden, Conn.

■

Telephone

A newly designed intercommunicating type telephone, uses full-size plastic transmitter-receiver type handset. It has compact wall-mounting base which contains push buttons, terminals and bell. Overall dimensions are 9-in. by 5½-in. It is a system of "common talking" type with two to ten stations, available for private line, code signaling, selective signaling and master station operation. Automatic Electric Company, 1033 West Van Buren St., Chicago, Ill.

AUTOMATIC ELECTRIC IDEALFONE

■

A-H. & H. DUPLEX RECEPTACLE

Duplex Receptacle

This new Duplex Bakelite outlet combines a standard "T" slot plug connection and also a three wire polarized plug outlet. Regular parallel or tandem blade caps fit one side, and 10 amp. three wire caps may be used in other. Styles are available with independently wired circuits or with common feed and return. Receptacles fit standard plates. Arrow-Hart & Hegeman Electric Co.

Lighting Fixture

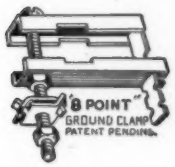
An RLM dome fixture with a sturdy housing and guard for use in gymnasiums. Housing is of heavy gauge steel with reinforced edges, conical in shape and finished in ivory. A guard of heavy gauge wire with an opening in center for relamping and cleaning is permanently fastened to housing. Reflecting surface of unit is white porcelain enamel. Goodrich Electric Co., 2900 North Oakley Ave., Chicago, Ill.

GOODRICH LIGHTING UNIT

■

Ground Clamp

This "8 Point" ground clamp has eight solid points of contact and is supplied with a new wire connector terminal. It cleans contact surface on rod or pipe. For high or low current or voltage. Fits any size rod from ⅜-in. to 1 1/16-in. or any size pipe from ¼-in. to ¾-in. Cadmium plated. Accessories Mfg. Co., 4612 N. Clark St., Chicago, Ill.



ACCESSORIES
GROUND CLAMP

■

Transformer

A new single plase, oil-filled, self-cooled distribution transformer, equipped with pocket stud-bushings on high-voltage side and tank wall stud-bushings on low-voltage side. Solderless connectors are set within bushing so that bared end of wire is protected. Bushings coordinated with winding insulation make transformer surge protected. Available 1½ to 10 kva. in core type and 15 to 100 kva. in shell type—up to 5000-volts. Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.

WAGNER
HEX
TRANSFORMER

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The conciseness characteristic of all Ward Leonard Relays, is due to sound engineering and careful workmanship. The very attributes that impart precision assure ruggedness and long life. Ward Leonard Relays are made in a wide variety of sizes, types and contact arrangements. Send for Bulletins describing relays of interest to you.

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YOUR customers are primarily interested in *Styles* in Door Chimes. They'll find it easy to make the selection from the Edwards Chime Display at your nearest wholesaler. . . . Or, if that's not convenient, our catalog illustrates the complete line in full color.

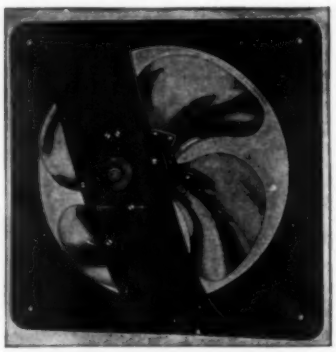
You, however, as a contractor, are vitally interested in installing *dependable* equipment. You know that for more than 67 years contractors have depended upon the entire line of Edwards signaling devices and equipment.

EQUIPMENT NEWS

[FROM PAGE 85]

Fan

A ventilating fan known as "Challenger", is for installation in walls, windows and transoms. Made in 10-, 12- and 16-inch sizes. Some of the features are—totally enclosed motor, self-lubricating bearings with wool-packed oil reservoir, chrome plated fan blades and easy-to-mount frame. Signal Electric Mfg. Co., Menominee, Mich.



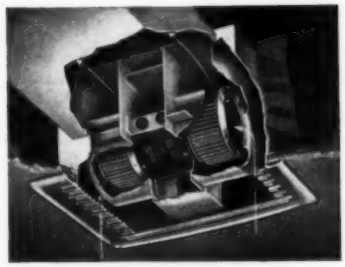
SIGNAL VENTILATING FAN

■

Plaster Cutter

Electric plaster cutter grooves plaster and plasterboard for installing oval electrical conduit and other equipment. Two thin abrasive wheels make clean cuts and plaster between falls out. Tool comes with the handle at the back, or side, made in two sizes. Cutting wheel measures 4 and 4¼ inches by $\frac{5}{64}$ inch by $\frac{1}{8}$ inch. Depth of cut 1¼ inches. Available for 110 and 220 volts with 15 feet of 3-wire cord with ground connection and plug. Wodack Electric Tool Corp., 4627 West Huron St., Chicago, Ill.

WODACK PLASTER CUTTER

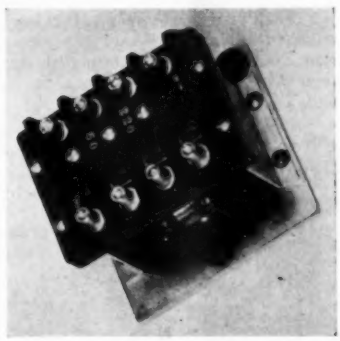


TRADE-WIND BLOWER

Kitchen Ventilator

A new electric kitchen ventilator with streamlined air inlet and outlet, a "squirrel cage" aluminum blower wheel and a motor and wiring housed in a separate compartment from air ducts. Motor compartment has separate outlet and plug for disconnecting the motor. Grille provides for removal of motor and fan assembly as a unit. Available for 110-volt, 50/60 cycle operation, 1/20 and 1/30 hp., single or two wheel units. Trade-wind Motor Fans Inc., 1325 Maple Ave., Los Angeles, Calif.

■



BENDER WARRICK CONTACTOR

Automatic Contactor

A new small contactor of large horsepower capacity for use where mounting space is limited. Overall measurements are 4-in. wide, 3⅞-in. high and 3½-in. deep. Ratings are 3 hp. at 110-volts, 5 hp. at 220-volts a.c., 7½ hp. at 440-550-volts. Can be furnished up to four poles, all normally open or closed or any combination. Inlaid silver contacts. Contactor is easily dismantled for maintenance. Furnished with or without enclosures. Bender Warrick Corp., Birmingham, Michigan.

■

Multi-breaker

A new two-pole multi-breaker is available in a 100 ampere frame, with a common trip in which an overload on one-pole automatically trips both poles. It is trip free and cannot be held closed on a short circuit or overload. Breakers are tamper proof, factory calibrated and sealed. Available for 115/230-volt a.c. service, 3-wire solid insulated groundable neutral, two-

pole with no neutral and in 50, 70, 90 and 100 ampere capacities. Can be furnished for flush or surface mounting. Square D Company, 6060 Rivard St., Detroit, Michigan.

SQUARE D M2 BREAKER

■

Reflector Lamp

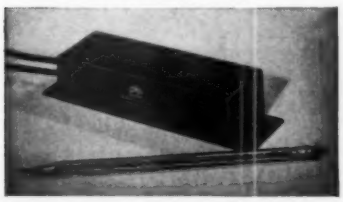
A line of 150-watt and 300-watt reflector lamps, designed for indoor supplementary spot and flood lighting. The R-40 bulb is used, including high-efficiency type filament, built-in reflecting surface and bell-shaped bulb with nearly flat end. Surface is protected against dust, dirt, moisture and fumes. Equipped with medium screw bases, each reflector lamp fits into a conventional socket but is recommended for use only in porcelain sockets. General Electric Co., Nela Park, Cleveland.

G-E REFLECTOR LAMP

■

Resistor

Type FL resistors designed for auxiliaries for d.c. operation of fluorescent lamps. Made of insulated wire wound type, with 1,250 volt insulation. Operate at a temperature rise of from approximately 40 to 50 deg. C with standard auxiliaries. Encased in metal boxes of special ventilated construction and fit any fixture channel. Overall box dimensions are approximately 6⅜-in by 1⅜-in. by 1¼-in. International Resistance Co., 401 North Broad St., Philadelphia, Pa.



IRC RESISTOR

Badger

Synchronous

ELECTRIC TIME SWITCHES

CONTRACTORS LIKE THEM BECAUSE:

they are dependable and easy to install

USERS LIKE THEM BECAUSE:

of economical operation and low cost

The Badger line of Time Switches is always in demand by Contractors who want dependability, accuracy, and the right type for a specific need. They know from experience that this is the line that gives them successful, profitable installations. They know when they install Badger Synchronous Electric Time Switches for their customers they are giving them complete satisfaction—accurate timing, economical operation, dependable service. You can't go wrong on Badger. Write for more particulars or see your Wholesaler.

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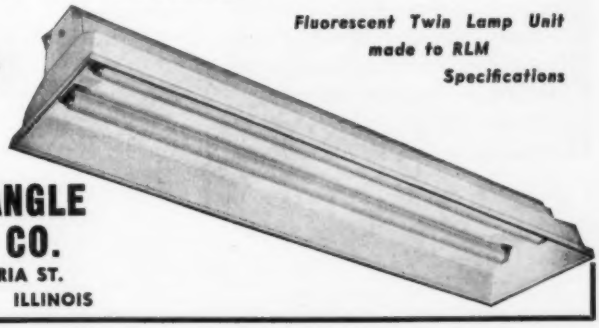
Long Beam Floodlights

IS THE LINE THAT GIVES YOU UNLIMITED SALES OPPORTUNITIES . . . . .

Silvered Bowl Diffuser

Every day Contractors are coming to rely on QUAD Lighting Units for good-looking, modern lighting jobs. Get ready now for the demand. The QUAD line covers any requirement for efficient, up-to-date lighting and will build up your sales volume — that means substantial income. Write for more detailed information.

Fluorescent Twin Lamp Unit made to RLM Specifications



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Tests Everything Electrical From 100 to 550 Volts

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FUSES

Indispensable to electricians. Equipped with Neon light which tells instantly where trouble lies in electric circuits, fuses, cut-outs, motors, radios, electric appliances; indicates hot or grounded wires; tells A.C. from D.C.

Only Test-O-Lite, original Neon tester, has exclusive patented safety features. Far superior to clumsy test bulb. Fountain pen size with pocket clip. Useful in homes also. List $1.50 at leading jobbers.

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Tell us why?
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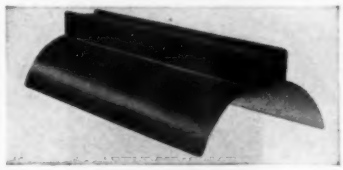
* See 1939-1940 Buyers' Reference number of Electrical Contracting for additional information on these companies and their products.

Reflecto Duct*
FOR FLUORESCENT —
NOW MADE FOR TULAMP BALLASTS



These Tulamp Ballasts will operate Two Lamps, with separate starting switch, at high power factor and with less flicker.

Made in two Types for 36" and 48" lamps

Model Tulamp—36—$12.50 List
Model Tulamp—48—$15.50 List

Ballast, lamps or sockets not included. Write for circulars.

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SHUTTERS
With the improved aluminum Tie-Rod which connects the louvres of every shutter, insuring uniform and simultaneous action. All sizes up to and including 30" at 20c per running inch. Sizes over 30" at 30c per running inch.
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Therefore, you'll please your customers by using G-E Wiring Materials. The quality of their performance can be depended upon. G-E Conduit, Wiring Devices and Wire and Cable are carefully designed to be used together and to give good service indefinitely. Only first grade raw materials are used in their manufacture. The line includes materials for wiring all types of buildings—residential, commercial, industrial and institutional.

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For contractors who are interested in wiring homes, General Electric has developed a modern wiring method called G-E Home Wiring that will provide the electrical adequacy home owners want today.

For further information about G-E Wiring Materials or G-E Home Wiring, see the nearest G-E Merchandise Distributor or write to Section CDW-0122, Appliance and Merchandise Department, Bridgeport, Connecticut.

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